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Steel Anchors for Merchant and Battleships

Large Increase in Demand on Eastern Steel Foundries—Stockless Type Versus Old Style—Heat Treatment—How Anchors Are Tested

BY EDWIN F. CONE

A MAJORITY of the anchors made in the United States are produced by foundries in the Chester, Pa., district, and they are cast of steel. While this particular phase of the steel-casting business has been always a minor one, it has at present assumed much larger proportions than ever before. The phenomenal increase in the number of ships of all kinds being built in this country is the immediate cause.

Previous to this the principal demand came from the United States Government, and the larger sized anchors made in the last fifteen or twenty years have been furnished for battleships, cruisers, dreadnaughts, etc. Every Government vessel, of course, has its quota of anchors, several to each. As the size of the dreadnaughts has increased so has the size of the anchor. The largest one ever made in this country, probably in the world, is shown by the larger illustration on this page. Its weight is 20,000 lb., and represents the large ones used in the superdreadnaughts of the U. S. Navy. It was made by the Penn Works, at Chester, Pa., of the Penn Seaboard Steel Corporation, for the U. S. S. Pennsylvania. It represents the type of anchor now generally used on all American merchant and naval ships. They vary in size from 200 lb. up to the one here represented, which is the Baldt anchor, manufactured for the Baldt Anchor Company of Chester, and named after the inventor, Fred Baldt, a pioneer steel foundryman.

Previous to the general introduction of this modern type, and when ships were much smaller, the style of anchor generally used is shown in the small illustration at the introduction of this article. It is known as the old-style anchor, in contradistinction to the one now in use, which is generally called the stockless type. The older style was usually made of wrought iron, but is now cast of steel, and is sometimes in request even now, especially for small vessels. The Baldt anchor was one of the first of the stockless type brought on the market. Since then several other designs of this type have been invented, so that more than one of the large steel foundries of the Chester district has its own anchor which it exploits. Some of these are the Admiral, the Dunn, the Bower, etc.

Some of the special features claimed for the stockless anchor here illustrated, as well as for others of the same general type, are:

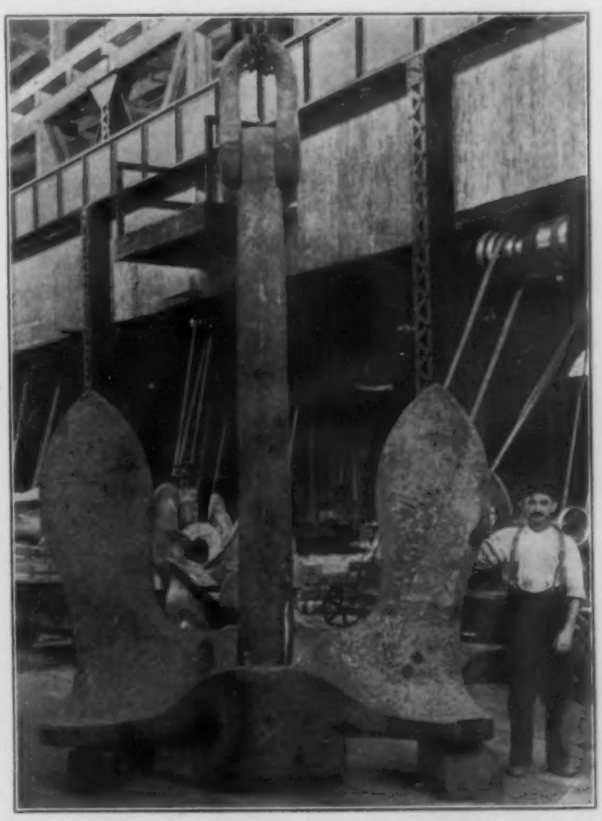
It is impossible to foul this anchor.

It is built on the ball and socket principle. Most anchors are hinged on a pin. After a time the shank shears off the pin and pulls through the head. In this particular design it is necessary to burst the head asunder to pull this shank through.

In the construction the back pin holds the shank in position, but this pin could be dispensed with, for the shank being rectangular would pull up in position and not interfere with the working of the anchors.

The base of the anchor is especially designed so that it fits in the hawsepipe of the ship, acting as a stopper. The flukes (or blades) rest against the side of the ship. The anchor does not catch on the base of the hawsepipe so that when the steamer or sailing vessel is under way the water can wash through the hawsepipe on deck.

In general, it is claimed that any anchor, like the old style, with a shank in an upright po-



The Largest Anchor Ever Made. It weighs 20,000 lb. and is a Baldt stockless anchor. These are now used on the U. S. S. Pennsylvania and other superdreadnaughts

sition when in service, is at a decided disadvantage, because it is essential that the anchor have sufficient cable to allow the shank to lie on the bottom. This is always easily possible with the stockless anchor.

The metal incorporated in the anchors now made is medium acid open-hearth steel containing 0.25 to 0.30 per cent carbon, 0.60 to 0.70 per cent manganese, 0.25 to 0.30 per cent silicon, and about 0.035 to 0.045 per cent sulphur and phosphorus. The tensile strength after proper heat treatment is 65,000 to 75,000 lb. per square inch, with an elastic ratio of about 50 to 52 per cent, and an elongation in 2 in. of about 22 to 30 per cent, and a reduction of area of about 35 to 45 per cent.

These static qualities could be easily improved by incorporating either vanadium or nickel in the steel, at the same time increasing the dynamic resistance of the metal. Thus far, neither the U. S. Government, nor any other purchaser, has considered it necessary. Nor has the adoption of a higher carbon metal—0.40 per cent carbon, with a tensile strength of 80,000 lb. per square inch—been chosen for the anchors, though for a few years now this grade of metal has been specified for all stems and stern frames of battleships and dreadnaughts.

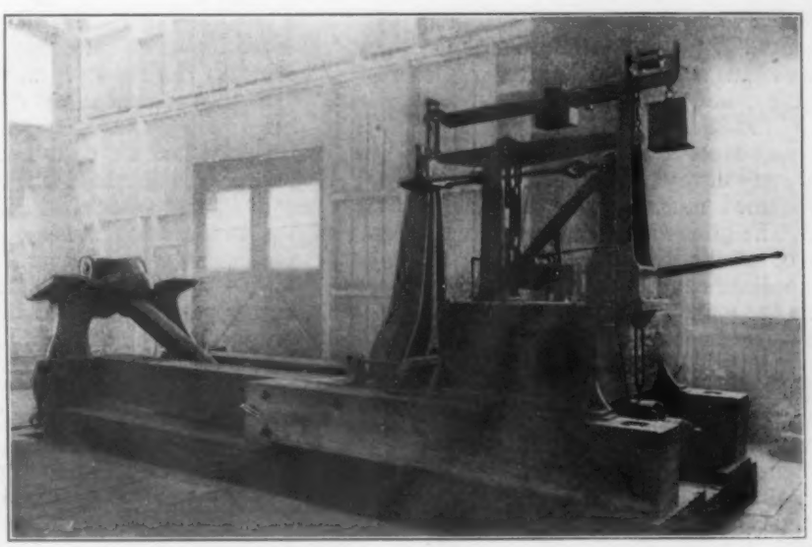
In the use of anything but the metal at present employed, the heat treatment would be a more vital question, and one to be more carefully watched, because in the case of vanadium, nickel or high carbon cast steel insufficient or improper heat treatment means a weaker casting than ordinary mild steel.

The proper heat treatment of an anchor has been often the bone of contention between the steel foundryman and the Government as represented by its inspector. The Government, in its specifications for anchors, has a special clause dealing with the annealing, and the claim from the other side has been made that its demands are unreasonable. Briefly, the clause referred to insists on a total annealing period of 108 hr. This period is divided into a certain number of hours in which to bring the casting to the required temperature, into the number of hours at which the casting must be held at this temperature and then into the number during which the heat must be allowed to die out.

To the average commercial foundryman, bent on getting out tonnage and not cognizant of the metallurgical reasons involved, these specifications have seemed unnecessary and unreasonable. The filling of them has often meant interference with the regular routine of annealing operations where the average casting is annealed in less than half the time, or else has involved the use of a special annealer for treating anchors only. In the past, when orders for anchors have been few, and the necessity of taking them has been wise, and almost compulsory, it can be readily appreciated that the temptation to shorten the annealing or to let the filing of the order drag has been a strong one, and one often yielded to.

Aside from the details of the correctness of the stipulated number of annealing hours, it is now more generally recognized than ever before that the Government has erred, if at all, on the safe side. The microscope has enabled us to delve into the inside of a casting. It has shown us that, especially in the case of thick sections of metal, such as in a 15,000 to 20,000-lb. anchor, that the inside may contain very large crystals while the outside may be properly heat treated.

To refine completely the metal of a large casting, time is necessary. To remove entirely all internal strains, complete and proper refinement are essential. To insure producing an anchor that is as strong and safe as possible, proper and complete annealing is vital. It is recognized that the safety of a large battleship or merchant vessel is often dependent on its anchor. One weak section or spot, due to careless or supposedly sufficient annealing, might involve the loss of lives or property. The stipulation of the time for heat treatment, and the watching of it carefully by the inspectors, are guarantees that complete refinement has been obtained, and that a reasonably safe anchor is the result. Subsequent static and drop tests will not ordinarily reveal incomplete refinement.



The Standard Anchor Testing Machine Used for Making the Proof Test on the Completed Anchor. This one is located at the Penn Works of the Penn Seaboard Steel Corporation, Chester, Pa.

The majority of the anchors produced in this country are made to three different specifications:

The United States Government
The American Bureau of Shipping
Lloyds Register (British)

Static tests of the metal after annealing are required by inspectors representing each one of these. The extent to which these are carried out, or the importance attached to them, varies widely. For the Government, very careful tests, representing two 8-in. test bars from each fluke of shank, are made, and the demands strictly adhered to. The American Bureau of Shipping and Lloyds Register, under the supervision of which many vessels are built in this country, do not attach so much importance to these tests, in many cases only a bending test being made.

In the light of recent knowledge and experience, it is a question to what extent a test bar of a steel casting really reflects the metal in the casting. To depend on this alone would be unwise. The drop test is employed to supplement the static test. Each important part of the anchor is lifted to a height determined by its size and allowed to fall by its own weight on a hard surface of some stipulated nature. It is then lifted by a crane and hammered all over with a heavy hammer. The ring of the metal being satisfactory, the specifications are met.

This is the extent to which the U. S. Government goes in purchasing anchors.

A full-size test of all anchors is required by the American Bureau of Shipping and Lloyd's British Register. This involves a special machine, shown in one of the illustrations. After the various parts of the finished anchor have been assembled it is tested as shown in the photograph. After placing the anchor in the position indicated, the clevis is attached to a plunger located in the trough of the construction. By pneumatic pressure a definite pull is exerted on the shank and flukes of the anchor, the amount being determined by the anchor's weight, as fixed by the tables of the inspection bureau. To test a 1000-lb. anchor, the proof strain demanded in Lloyd's is about 25,000 lb. The weight on the beam is set at 25,000 lb., and when, from the pull exerted, the beam lifts, the test is completed. For a 17,800-lb. anchor the proof strain required is very close to 200,000 lb. The proof strain for the large 20,000-lb. anchor would be about 225,000 lb., but so large an anchor has never been tested. They have been made only for the U. S. Government. Several of these are in use, or ready for use, on the Pennsylvania, the Arizona and the Mississippi. Usually, an anchor easily stands this test, though some shanks have broken from defects in the metal due to blow holes, poor annealing, etc. It will be noticed that in this test the anchor is very much in the position that it is in service.

Why the U. S. Government has never adopted this test is not clear. It has been used by the British Government for years. It would seem that it would make assurance doubly sure, if of any value at all, for, as already stated, static and drop tests do not necessarily bring to light all the defects of so important a casting, especially in the case of unsatisfactory heat treatment.

The fitting up and putting together of these anchors is by no means a small matter. It is not in line with the general routine of a steel foundry's work, and interferes often with the regular work; nor has there even been enough of such work to make it a specialty. It is natural that the foundries of the district referred to should be looked to for such castings. It is these foundries which for so many years have supplied the U. S. Navy with all its very large and small important steel castings for its battleships, cruisers and dreadnoughts, as well as for very many merchant ships. A new problem comes to them now, for the demand for these anchors has many times more than doubled. Driven as they never have been before, with orders of all kinds, the filling of such orders, while a patriotic duty, is, nevertheless, a decided burden.

It is interesting to speculate as to just what sized anchors will be necessary for the new 850-ft. superdreadnoughts about to be built for our new navy. They will be, of course, considerably larger than the 20,000-lb. anchor, now the largest. It is the writer's distinct memory that only a few years ago several 10,500-lb. Dunn anchors were shipped from Chester, Pa., to the Pacific Coast for use by the U. S. S. Ohio, then being built at the Union Iron Works. Then those were considered very large.

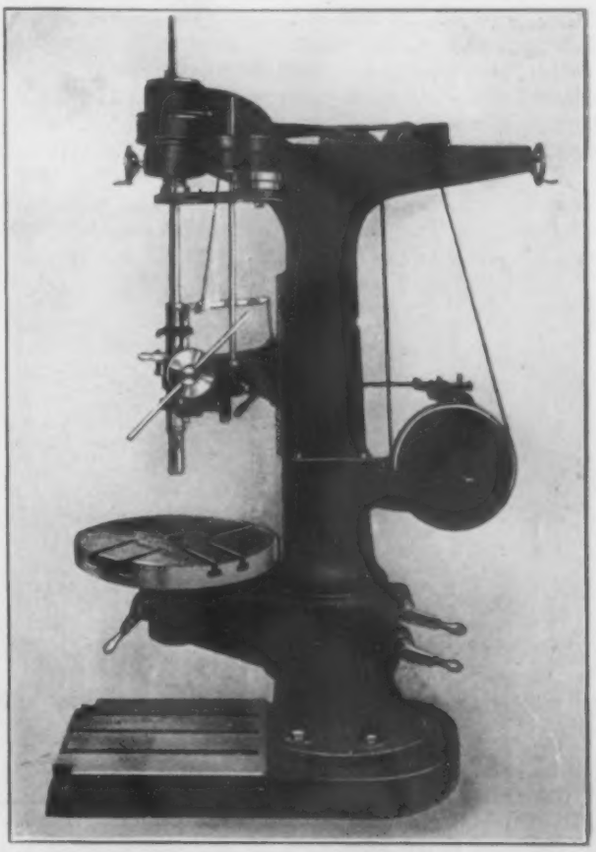
The industrial preparedness census has shown a co-operation of the industries to the extent that 75 to 80 per cent of firms doing business annually in excess of $100,000 have responded.

Mayor James Rolph, Jr., San Francisco, Cal., is preparing to have a practical test made of a method of reducing iron ore with oil fuel, invented by A. Bourcoud, a Spanish engineer.

New Sensitive Drilling Machine

The Cincinnati Pulley Machinery Company, Covington, Ky., has recently put on the market a type of a sensitive drilling machine, which is provided with a flat working base, measuring 24 x 26 in., and resting on the floor, so that heavy castings can be worked on, which is sometimes not possible on the usual table furnished. For light work a round swinging table 24 in. in diameter is supplied that can be swung out of the way when the bottom base is used.

The maximum distance from the spindle to the round table is 18 in. and from the spindle to the floor base 42½ in. and the minimum distance from the spindle to the floor base is 17½ in. Changes of spindle speed are obtained in the usual manner by shifting the belt to the different steps of the countershaft cone pulley. Holes from ¾ to 1⅛ in. in diameter can be drilled and the maximum speed is 12,000 r.p.m.



This Single-Spindle Sensitive Drilling Machine Is Equipped with a Round Swinging Table for Ordinary Work and a Flat Base for Heavy Castings

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The Welsh Tin-Plate Trade

Tin-plate exports from Swansea, Wales, have shown a steady decline since the war started. In July, 1913, they were 27,031 gross tons, from which they declined to 26,100 tons in July, 1914, to 19,470 tons in July, 1915, and to 17,384 tons in July, 1916, of which 8166 tons went to France, 3044 tons to Scandinavia, 2343 tons to Japan, 1658 tons to China, Hong-kong, Straits Settlements and Siberia and 137 tons to Chile. The decline in exports of black plates and galvanized sheets has been equally pronounced. A comparison of the exports of the three commodities is shown as follows in gross tons for the calendar years:

	1913	1914	1915
Tin plates	261,646	221,670	201,712
Black plates	57,561	17,216	42,036
Galvanized sheets	49,417	27,598	9,851

Tin-plate exports from the United States in 1915 were 154,541 gross tons, and for the fiscal year ended June 30, 1916, they had advanced to 230,472 tons.

L. J. Cohen & Co., dealers in old metals and metal goods, have acquired a building at 4812 McKissock Avenue, St. Louis, Mo.

Iron Carburization by Blast-Furnace Gas*

Effect on Wrought Iron and Analyses of the Deposits—Remarkable Disruption of Screw Threads — Disintegration of Fire Brick

BY DR. J. E. STEAD

T. H. BYROM, in his paper on "The Carburization of Iron at Low Temperatures in Blast-Furnace Gases,"† showed that soft steel, when exposed to the action of the gases from blast furnaces at the Wigan furnaces, which were employed in the manufacture of ferromanganese, is substantially converted into carbide of iron, Fe_3C, without the formation of any free carbon in the interior of the mass. The temperature of the gases varied between 600 and 700 deg. C.

Sir Lowthian Bell, previous to 1872, showed that when carbonic oxide is passed over iron oxide at 400 deg. C. and above, reduction of the oxide to the metallic state is more or less complete, and coincidentally the carbonic oxide is reduced to free carbon in the spongy mass. John Pattinson, previous to 1876, working in conjunction with Charles Wood, proved that firebricks, used in furnace linings, if they contained free oxides of iron, disintegrated in course of time, due to the same peculiar reaction. The carbonic oxide penetrating the porous bricks, attacked the oxide and deposited carbon, which, exerting enormous pressure, burst the bricks into pieces.

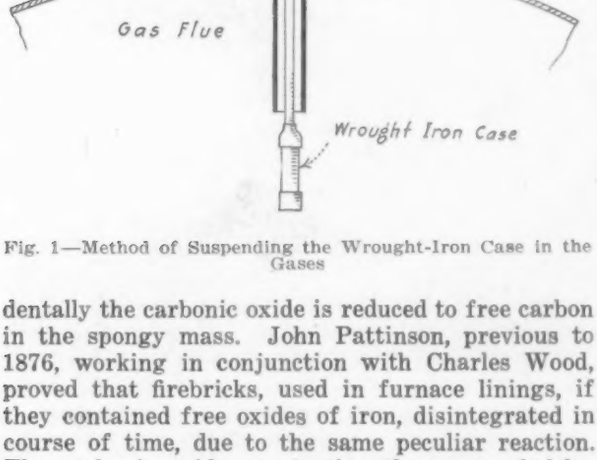


Fig. 1—Method of Suspending the Wrought-Iron Case in the Gases

Pattinson also recorded the results of an examination of a black powder found in the concrete of a gas-flue at the Tees Iron Works. It contained the following:

	Per Cent
Carbon	91.76
Iron	3.54
Phosphorus	0.043
Silica oxygen	1.777
Loss on drying at 212 deg. Fahr.	2.880

Ratio of iron to carbon..... $\frac{91.76}{3.54} = \frac{25 \text{ carbon}}{1 \text{ iron}}$

Pieces of cast iron, having all the properties of Cleveland pig iron, were found inside the mass of black deposit. In the incombustible part of the black substance, excluding the oxygen, the elements were found to be associated in the same ratio as they exist in Cleveland pig iron. It was assumed that rusted pieces of Cleveland scrap iron had accidentally got into the concrete, that the carbonic oxide had attacked the rust, and the spongy iron produced had induced the continuous deposition of carbon from the carbon oxide.

The exact reactions which actually occur are far from being clear, and it is doubtful whether they can be dismissed by the formula usually advanced. The question as to whether the lower oxides of iron play any part in the reaction is not clear.

It is known that during the carburization of iron in the cementation process, the carbonic oxide gas is the vehicle of the carbon and that carbon dioxide and iron carbide are the products:

$$Fe_3 + (CO)n = Fe_3C + (CO_2)n + (CO)n,$$

and that it is improbable that oxides of iron play any part as an intermediary.

Much might be written on the alleged chemical and catalytic reactions, but it is not proposed to do this at present, the object being to show that apparently the oxides imprisoned in wrought iron induce carbon precipitation, and the partial disintegration of the iron itself, when such iron is heated in blast-furnace gases rich in carbonic oxide. It has been shown that at 550 deg. C. and above, gases containing about 30 per cent carbonic oxide and 3 to 4 per cent carbonic acid rapidly carburize iron, but at lower temperatures than 500 deg. C. there is no carburization.

The object here is to describe the effect of blast-furnace gases on wrought iron, at temperatures between 400 and 500 deg. C. The phenomena were observed quite incidentally when experimenting on the magnetic properties of manganese steels with the object of ascertaining the effect of very prolonged heating at relatively low temperatures. Bars of steels were placed inside of a wrought-iron tube or case, and the case with contents was placed in the middle of a gas flue, where the temperature ranged between 400 and 500 deg. C., and was allowed to remain there for nearly two years, but the case and the bars were removed and examined at intervals.

Fig. 1 clearly shows the method of suspending the case in the gases. After exposure for a year, the wrought-iron tubes were found to be blistered in many places, and at certain points layers of the iron had been torn away from the places where the screwing terminated and were beginning to curl over in the way illustrated in the sketches.

As one had the opportunity of examining the outside of the case at intervals, the gradual and progressive tearing action was followed. From the first it was clear that carbon was being deposited from the gas and was responsible for causing the disruption. Fig. 2, *a*, *b*, *c*, *d*, show step by step the mechanical effect of the carbon. It is almost certain that that element was continually deposited along the line of cinder, and behaved just as if it were the point of a planing tool.

The iron itself was not carburized, as was proved by an analysis which gave only 0.05 per cent carbon, a fact justifying the conclusion that the temperature had not exceeded about 500 deg. C. On screwing off the cap to get at the bars, a considerable quantity of fine dense black powder fell out with

*From a paper presented at the autumn meeting of the Iron and Steel Institute in London, England, Sept. 22, 1916.

†Delivered before the autumn meeting of the Institute in Sept., 1915. Abstracted in THE IRON AGE, Nov. 18, 1915.

the bars, and the lower part of the upper tube contained much of the same substance loosely adhering to its sides. In physical appearance the powder resembled lamp-black.

All the blisters on the tubes were filled with this black powder, and some had deposited on the inside walls of the thicker tube as well as the walls of the thin tube. Originally these walls, as well as the exterior surfaces, were coated with a thin layer of blue scale, as is usual with all such hot rolled material. Carbon seems to have deposited over the whole interior surfaces, but none at all on the exterior portions, excepting at the parts which had been cold distorted at the screwed portions beyond the terminations of the caps. Fig. 3 represents a section through the wrought-iron case and upper tube and the parts marked *A* where carbon had deposited.

A most remarkable circumstance was noted about the places at *A*. Parts of the screw-threads had been removed by the disruptive effect of the carbon from the gases. Originally the threads were continuous to the end *B*, but after two years only the black deposit remained, together with particles of the iron which had been disrupted. A slight coating of black deposit was found on the bars of manganese steel, even on the faces that had been polished.

There was not sufficient of the powders to make thorough analyses, but both free iron and magnetic oxide were isolated. The free iron was determined by finding the amount of copper, given weights of the powders precipitated, and from that the iron was calculated. Each of the powders on treating with dilute sulphuric acid gave off hydrogen gas.

The residue, after dissolving out the free iron, contained carbon and a black substance readily attracted by a magnet, and after this was separated the carbonaceous residue contained non-magnetic oxides equivalent to about 20 per cent of non-magnetic oxide on the original sample. The partial analyses were as follows:

	Inside the Case, Per Cent	Inside the Upper Tube, Per Cent
Carbon	27.8	72.60
Free iron	10.9	7.90
Non-magnetic oxide	21.0 }	Iron 13.50
Magnetic oxide	26.0 }	
Manganese oxide	1.3	0.25
Silica	2.9	0.90
Total iron	44.4	21.4

The quantity of powder from the upper tube was not sufficient on which to determine the amount of magnetic and other oxides. The larger amount

Fig. 2—The Mechanical Effect of the Carbon is Shown Here Step by Step. It is believed to have acted much as if it were the point of a planing tool

of manganese in the deposit found in the case itself suggests that a portion of it had come from the surfaces of the manganese steel bars. As the caps were screwed tightly on to the ends of the case, it was supposed the case was quite gas-tight; and if it was, one is forced to the tentative conclusion that carbonic oxide passed through the solid iron.

That it is capable of penetrating iron to a depth of about a quarter of an inch at 600 to 650 deg. C. has been proved by previous experiment, but that it should penetrate right through the iron and deposit carbon on the inside walls of the iron tubes at under 500 deg. C., if true, is very remarkable, and further trials are being conducted to confirm or negative these observations.

The explanation offered for the disruptive action on the screwed portion of the tube is that, in the act of making the screw, the inclosed cinder

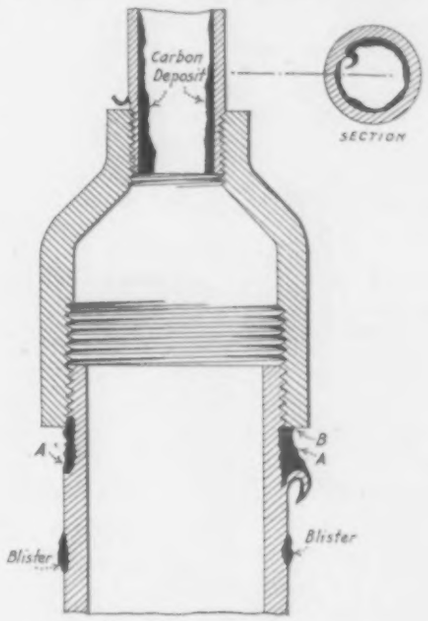


Fig. 3—A Section Through the Wrought-Iron Case and Upper Tube. Portions marked *A* are where carbon has deposited

layers and threads were crushed and made very porous to gases, and the CO gas penetrated and burst away the metal above the cinder layers.

On testing the black deposits for carbon by color, only traces were found in the deposit from the upper tube, but 0.21 per cent in that from the lower tube; a portion of this may have come from the manganese steels, which contained up to 2 per cent carbon. Incidentally, it may be remarked that at high temperatures spongy iron reduced from iron ore is rapidly carburized, and it is justifiable to believe that as ore is reduced and descends down the shaft of a blast furnace it becomes highly carburized before it reaches the melting zone, and not, as is usually assumed, that it remains as spongy iron till it begins to melt. It is more than probable that before the reduced iron is half way down to the hearth it will have combined with at least 2 per cent carbon.

In reviewing the result of the observations and experiment given in this note, it would appear:

That even hard and refractory iron scale and the magnetic cinder inclosed in wrought iron are capable of reacting with carbonic oxide at temperatures between 400 deg. and 500 deg. C.

That wrought iron containing free oxides is capable of being partially broken up by the action of carbonic oxide gas on the inclosed oxides or cinder.

That under the conditions named even initially non-oxidized steel acts on carbonic oxide gas, inducing carbon to be deposited on the surface.

Announcement is made that the Chinese Government has closed a contract with the Siems-Carey Company of St. Paul, Minn., for the construction of more than 2000 miles of railroad in China. The Siems-Carey Company is financed by the American International Corporation of New York. The route of the railroad has not been determined upon. The probable cost of the work, according to dispatches from Peking, will be over $100,000,000.

RECLAMATION OF BRASS ASHES*

Processes Outlined for Recovering Coal as Well as Fine Metal Particles

BY ARTHUR F. TAGGART

Considerable loss is sustained in brass foundries by the failure to reclaim as fully as might be done the metals and unburned fuel which are now disposed of as part of the waste of the plant. A sizing-assay test of a typical casting shop ash showed 10.05 per cent copper, which on the basis of 65-35 brass meant 5.4 per cent zinc. A sorting test revealed about 15 per cent

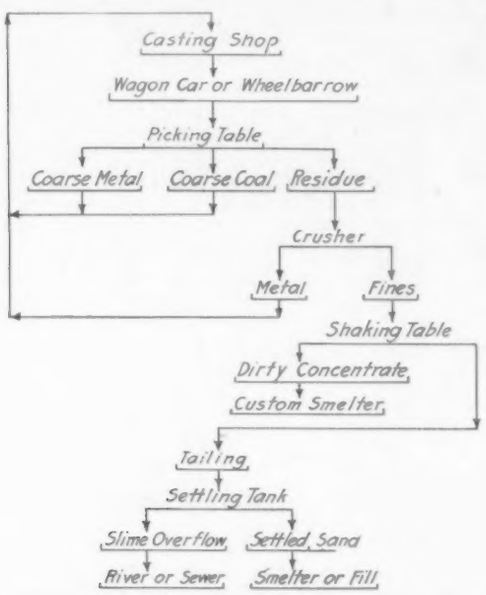


Fig. 1—The Ordinary Process of Reclaiming Brass Ashes Wastes a Large Percentage of the Valuable Material

of unburned or partly burned coal. The money value per ton of this ash, at normal prices for materials is:

Copper, 10 per cent, 200 lb. at 13c	$26.00
Zinc, 5.4 per cent, 108 lb. at 6c	6.48
Coal, 15 per cent, 300 lb. at $2 per ton	.30
	$32.78

The method of recovering these values varies in different plants, according to the size of the plant and the consequent production of ashes, and according also to the technical talent available. Some small plants sell directly to local junk dealers, others ship to custom scrap metal plants; the large majority treat the ashes by some crude method to recover the coarse metal. Some of these sell the fine residue at absurdly low prices, while others use it for filling in low ground around the plant. A few of the larger companies treat the ashes in modern, well-designed reclaiming plants, obtaining as products clean coarse metal which can be melted directly into ingots, and fine rich concentrate which is smelted on the ground and which also yields ingot metal.

In many brass foundries the reclaiming plant consists of a picking floor or table, from which coarse metal and lump coal are removed, followed by a grinder with restricted discharge. A part of the residue from the picking table is charged into the grinder, and when the discharge through the screen has practically ceased, the accumulated cleaned metal is removed. This process is repeated until the accumulation of ashes is cleaned up. The fine product from the grinder is usually run over a shaking table of the Wilfley type, from which a dirty concentrate is recovered. The tailing of the table goes to a settling tank or pond, the overflow of which goes to the river or the sewer. The material settling in the tank is sold for what it will bring. Fig. 1 is a flow-sheet of such a plant.

The above process recovers only a fraction of the metal and coal in the ash, whereas a proper method of treatment would recover nearly all. The factors which must be considered in the design of such a plant are:

1. The character and quantity of the ashes; 2, the treatment of the products of the concentrating plant; 3, the characteristics of the machinery to be employed; 4, costs, both capital and operating, and their effect on percentage of recovery.

The first step is to make a sizing-sorting-assay test of the original ashes, to obtain the necessary information concerning the distribution of metallic values and coal and the amount of slag that must be ground. Grinding, sorting and microscopic tests on the slag afford knowledge as to the distribution and size of the metallic shot which it contains and thus tell to what extent comminution must be carried in order to free for concentration the economic maximum of metal. From the knowledge thus gained an experimental flow-sheet or mill scheme is built up in the laboratory and a test run made to confirm the deductions from the original test. From this test run, and, if necessary, subsequent test runs, a tentative flow-sheet for the mill installation is drawn up. This scheme must be examined from the point of view of economical operation, and a balance struck between capital charges and operating costs for the particular quantity of ashes available for daily treatment.

It is best to outline the tentative flow-sheet without consideration of the tonnage to be treated, with the aim only of maximum recovery, and estimate the capital and operating costs of this installation. Then by the

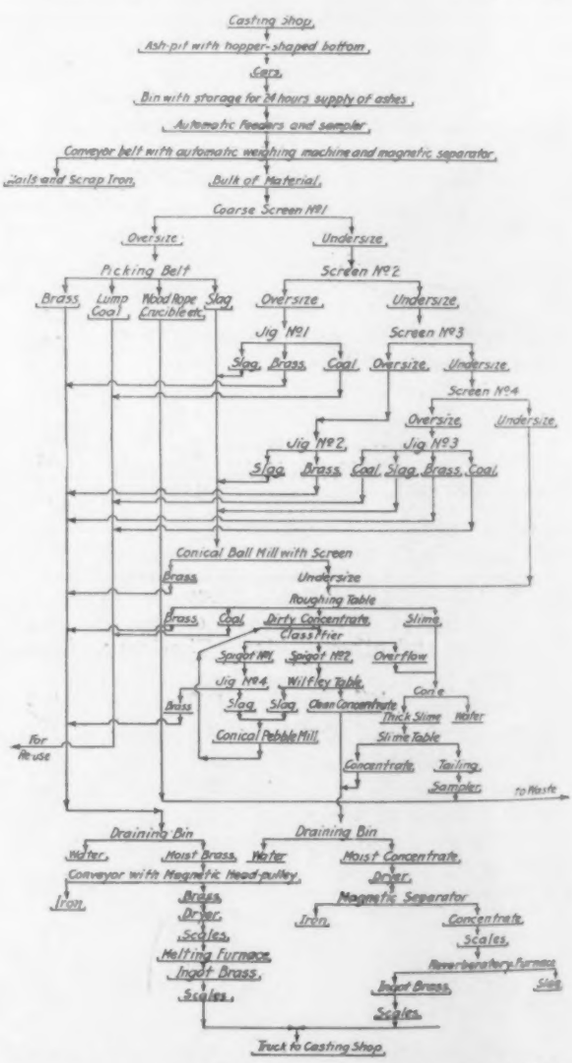


Fig. 2—A Complete Reclaiming Plant Will Recover All but a Minute Fraction of the Coal and Metal from the Ashes

successive elimination of one machine after another and a corresponding revision of cost figures and recovery percentages a point will be finally reached which promises maximum financial return.

In Fig. 2 is given a tentative flow-sheet for a plant to treat casting ashes ranging in size from 4 in. down

*Abstract of a paper presented Sept. 13, 1916, at the meeting of the American Institute of Metals at Cleveland. The author is identified with the Hammond Laboratory, Yale University, New Haven.

to dust and containing 15 to 20 per cent metal and 25 to 30 per cent unburned and partially burned coal. Certain fundamental principles leading to a maximum recovery have been followed. No material containing free metal, i. e., metal with no adhering slag, has been sent to a crusher. This means no unnecessary grinding of metal, which would produce fine metallic flakes difficult to recover. No coal is ground. Only the slag which contains included metal shot is sent to the grinders. No material is thrown away until it has been ground to the finest size. This is done because microscopic examination of the slag has shown included shot in slag particles as small as 0.005 in. diameter. Such a plant as this can be made to discharge tailing containing not more than one-half of one per cent metallic copper. Not less than 5 tons of ashes per hour

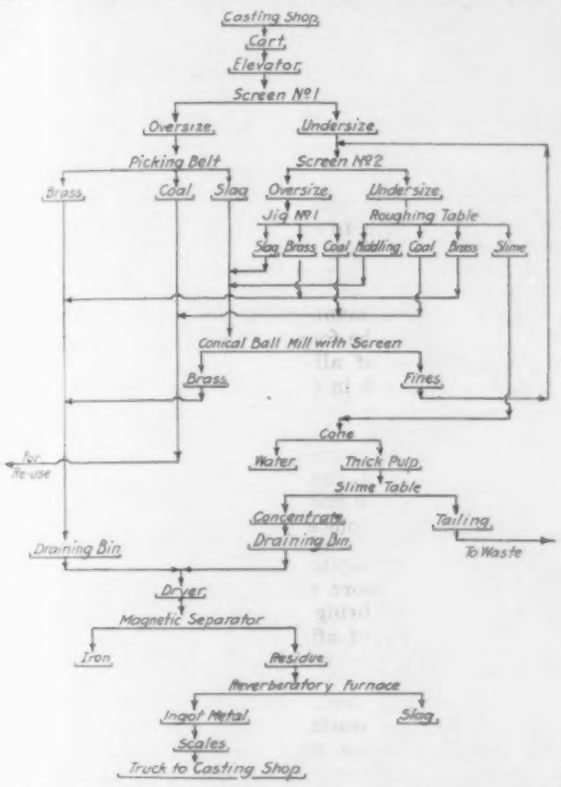


Fig. 3—Where the Amount of Material to be Handled is of Small Volume This Simpler Arrangement will be Economical

should be handled in such an elaborate plant. A simpler plant for a smaller quantity is outlined in Fig. 3.

The costs of the plants above outlined will depend, of course, on the character of the housing. The smaller plant, with a capacity of 20 tons per day, housed in a wooden building, will cost $15,000 to $20,000. The larger, with a capacity up to 200 tons per day, housed in a steel building, will cost $80,000 to $100,000.

Smokestacks of Spiral Pipe

A smokestack 50 ft. high has been supplied to the city of Chicago by the Standard Spiral Pipe Works. It is a single piece of the company's standard reinforced spiral pipe. The company recently built for its own use two stacks 55 ft. long from single pieces of 20-in. pipe. These stacks were guyed with but one set of wires each and recently were given a severe test when a wind storm passed over that section of the city. It is stated that other smokestacks in this neighborhood having from two to four sets of guys of the same length were blown down, together with telegraph poles and trolley wires, while the stacks in question were not affected.

The Timken Roller Bearing Company, Canton, Ohio, started its new steel plant last week, taking the first heat from one of its 6-ton Heroult electric furnaces. The company will ultimately install four Heroult furnaces for the manufacture of steel billets for use in its own plant, but it will probably be some time before the other three furnaces are erected.

Machine for Relieving Formed Cutters

A machine designed for relieving formed milling cutters up to 13½ in. in diameter and any number of flutes from 1 to 28 inclusive and every even number of flutes from 28 to 42 has been brought out by the Cleveland Milling Machine Company, Cleveland, Ohio. This is

This Machine Was Designed to Give Straight, Side or End Relief on Cutters up to 13½ In. in Diameter and Having from 1 to 28 Flutes

said to be the only standard relieving machine on the market. It has been customary for makers of milling cutters to fit up an attachment to a lathe to do this work or design a special machine for relieving. The Cleveland relieving machine is designed to give straight, side and end relief for all work within its capacity.

It is made extremely rigid, heavily ribbed, the box section being used in constructing the main parts. The spindle is driven by a large wormwheel lined with solid taper bearings adjustable by one nut at the outside of the machine. The spindle has a clutch drive to insure the positive rotation of the tool to be relieved. All gears and shafts are hardened and ground and run in oil on roller bearings.

The machine is arranged for a single-pulley drive providing five mechanical speed changes for the spindle in geometrical progression. One of the important features of the machine is the single-throw cam that is adjustable from nothing to ¾-in. relief. The camshaft runs directly through the center of the machine and operates almost exactly under the tool slide. The machine is arranged so that the tooth to be formed can be placed in proper rotation with the forming tool without loosening any bolts or nuts. Another advantage claimed for this machine is that the tool holder block is adjustable for holding tools from ¼ to ⅝ in. in thickness. The carriage and apron are made in one piece, thus assuring additional rigidity to the tool slide which is readily adjustable for setting for side and end relief. The machine weighs approximately 7000 lb.

A Course in Foreign Trade

A foreign trade course for the season of 1916-17 is to be given by the Philadelphia School of Commerce and Accounts at the Central Y. M. C. A., Philadelphia. The first term of the new year began Oct. 2, when a beginners' course was planned. Advanced instruction is also to be given. The second term begins Jan. 29, 1917. Each of the two evenings a week devoted to this course is divided between foreign trade topics and languages.

The sales offices at 90 West Street, New York City, of the Erie Engine Works, Erie, Pa., maker of steam engines and boilers, will hereafter be conducted under the management of W. B. Connor, Inc., which concern has been appointed general sales agent for New York territory and for export.

Educational Extension by Practical Men

The Man Who Is Employed Can Make Himself More Valuable or Rise to Become an Executive by Continuing to Educate Himself

BY STERLING H. BUNNELL

No matter how scarce unskilled labor may be, skilled labor is always scarcer. Men capable of leadership are never enough for the opportunities waiting. Manufacturers and business men are therefore always interested in the attempts made by some few of their employees to develop capacity for responsibility. A fair day's work can hardly do more than maintain the worker in the position where he is, and can give him only the hope of slow promotion as continued experience provides increasing manual or clerical skill. To break out of the ranks into leadership requires unlimited effort, disregard of the eight-hour limit "approved by society" in one's own personal schedule of work, and an intelligent and persistent effort to continue and extend whatever education may have been already obtained.

EDUCATION SHOULD NEVER STOP

Much energy was expended a few years ago in arguing the proposition that college education disqualifies men for success. Interest in the controversy ceased as educational opportunities increased the proportion of successful men who have been through college or technical school. However, conspicuous examples of leading executives who started as office boys or mill hands at 14 years of age are as numerous as ever. The obvious conclusion is that the kind of education which brings success is something that may be pursued out of school, and is not necessarily among the branches taught in college.

In the broadest sense, education never stops for any man. From school or college to the end of business life, the education that gives the knowledge necessary to the handling of unusual conditions goes on continuously. The ability to carry responsibility, to act when and as required by unusual circumstances, may develop gradually out of the ordinary routine of work, but can be gained more rapidly and surely by constant and direct study.

Education in connection with an illustration of practical experience is the purpose of the numerous private auxiliary and special vocational schools which supplement the general educational system. Schools for teaching bookkeeping and clerical work, stenography and typewriting, salesmanship, advertising and commercial practice are within reach of almost every resident of a town or city, and form part of the free school plan of not a few large cities. Specializing further, there are apprentice and trade courses, and textile, agricultural, accounting and banking schools, some privately operated by corporations, others provided by city or State governments.

THE DAY'S WORK MAKES PART OF A MAN'S EDUCATION

All these schools express the fact that direct study along particular lines makes workers more efficient and therefore increases their earning power. But attendance at such schools is not necessary to success in business. The same or better educational results can be secured by every man who will take the trouble to make his day's work part of his education, and continue in the shop or office the same habits of observation and study that are required for success in school.

It is perfectly evident that the successful executive who commenced work as a boy of 14 did not then understand the theories of salesmanship, accounting, management and finance, but must have acquired the knowledge somewhere along the way to his present responsibilities. Obviously, every factory or office worker who looks forward to a better job should get busy at once on the necessary self-education. For observer and teacher he must serve himself, and learn to look on himself and on his work as impartially as on another man. Let him consider the methods he used in getting his job. They must have succeeded, which is to say that he must have presented himself as the most competent applicant for the position. That was salesmanship; he sold his services, took the order for himself, and established pleasant relations with his employer.

Success in getting and holding a job is always connected with salesmanship, and with this idea in mind the opportunity for education along this line is in reach. The material for practical experiment and demonstration is at hand in the fellow workers. Each has his own likes, dislikes, strong and weak points. The ability to take successful charge of a force later is gained by studying one's associates from day to day. The big man is less often the man whose mind is full of figures and data than the man who knows how to keep a body of workers from developing time-wasting friction between themselves.

The general principle of salesmanship, like that of management, is to interest the other man in doing what you want him to do for the advantage of both of you. Having grasped the idea of the principle, the theme may be expanded by reading some of the numerous books on management and on salesmanship, lists of which may be found in libraries everywhere.

The backbone of all business is finance, a subject which is not taught in the common schools. While absolutely necessary to success, it is among average men studied about as frequently as classical Greek. The illiterate immigrant running a two-chair bootblacking stand is an expert in finance compared with the average well-paid foreman, office man or shop superintendent. The bootblacking capitalist with one employee knows he must take in more than he pays out, and he also knows what hours bring in the most nickels and dimes, what outlay for rent affords a location that will catch enough customers to pay his expenses, what part of his takings go for labor, supplies and repairs, and what his "good will" is worth when he is ready to sell out and move to a better stand. His little business is a financial primer from which he learns his practical lesson.

A member of a large manufacturing organization has in comparison with the bootblack a whole library of text-books from which to learn the principles of cost-keeping, accounting and corporation finance along with his daily work. He ought to investigate and illustrate to himself such matters as the effect of a raise in wages on the cost of the factory product; the proportion of cost which waste in using materials may affect; the value of the time which he consumes in unnecessary conversation, wasted efforts and unnecessary mistakes and false moves. He should know in advance whether his own work is worth an increase in wages, and, if so, whether the business can afford to pay it. He must know how to ascertain all such facts before he can hope to hold a position as general manager.

The methods used in commerce and in transportation should be part of the education of the man who intends to succeed. Large sums are saved to corporations, and large salaries earned, by traffic men who know how to reduce the volume of shipping packages, arrange shipments so as to take classifications as goods carrying low freight rates, and route so as to save time or obtain more convenient delivery at destination. Railroad maps are more important to most business men than the lines of counties and states. The well-informed man should be familiar with the routes of the principal systems and their smaller competitors, down to the little feeder lines which always indicate on the

map the location of factories, mines, farm regions and other sources of wealth.

PRACTICAL EDUCATIONAL SUBJECTS ALMOST UNLIMITED

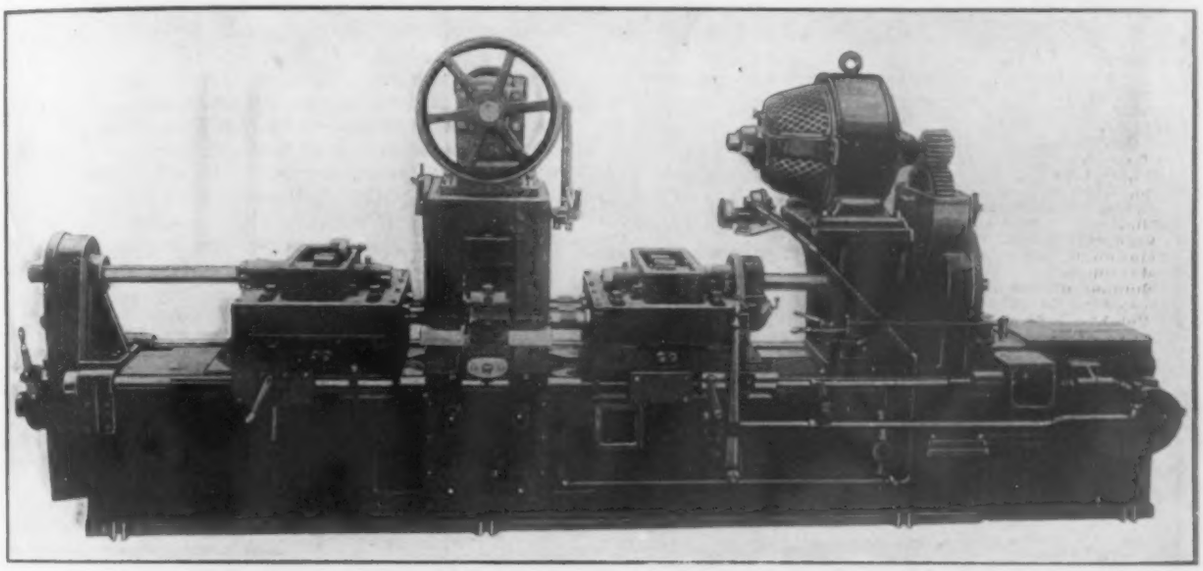
The list of practical subjects for continuing an education might be indefinitely extended. International trade, export and import customs and conditions, articles and materials exchanged with foreign countries, and national systems of weights, measures and coinage are daily becoming more important. Men are in demand who are familiar with these details and can assist in developing foreign trade. Foreign languages, which are not considered too difficult for general study in other countries than the United States, should not be too difficult for Americans. Language and literature are important indications of the characteristics of the citizens of a country, and some knowledge of them opens the door to success in foreign trade.

We of the United States have yet much to learn of the possibilities of practical education. The country in general continues to offer only the one-track general school course commenced by the pioneers of a new continent in an age when specialized manufacturing was unknown. The small proportion of the population who are able to go to the end of the track at graduation from college have the advantage of the best the system can offer for professional work. But, like the boys and girls who turn off the track just beyond the elementary school, they can attain success only by continuing their education in practical subjects through the work of every day.

A Five-Spindle Rail Drilling Machine

A horizontal rail drilling machine capable of drilling five holes at one time has been placed on the market by the Newton Machine Tool Works, Inc., Philadelphia, Pa. The holes are drilled by two groups of spindles located on opposite sides of the rail. Among the advantages claimed for the machine is the drilling of holes at close center distances.

The spindles are arranged in two groups, the one at the right of the rail consisting of a fixed central spindle and two outer ones which can be adjusted to give center distances ranging from 4 to 10½ in. In the other head the spindles can be adjusted to within 1 in. of the center line of the central fixed spindle on the opposite head. In this way it is possible to drill holes with a center distance of 1 in., and these spindles can be adjusted to give center distances ranging from 4 to 19 in. The maximum distance between the ends of the spindles is 26 in., and each spindle has a feed of 12 in. and four different rates. The arrangement of the feed, it is pointed out, enables a full length drill to be removed without disturbing the setting of the rail. Rapid power traverse is provided in both directions. All the spindle gears are of heat-treated alloy steel.



In This Five-Spindle Horizontal Rail Drilling Machine the Center Spindle in the Head at the Right Is Fixed in Position While the Others in That Head and Those in the Opposite One Are Adjustable to Give Variable Distances Between Their Centers

The spindle saddles have a full bearing on the base with strap and taper shoes to compensate for wear. A common pair of feed screws with right and left hand threads are provided to secure simultaneous operation. An adjustable automatic stop for the feed motion and a rapid power return are provided for the saddles, together with a safety limit, which is relied upon to prevent jamming at either end of the saddle movement.

An adjustable elevating table with an air-controlled clamp is provided to take care of the different sizes of rails. The machine is driven by a 15-hp. motor having a speed range of from 400 to 1200 r.p.m.

To Build Direct-Driven Gas-Engine Compressors

Clark & Norton, Wellsville, N. Y., have erected a gray-iron foundry, 80 x 160 ft. in size, adjoining their plant. It is equipped with a 60-in. cupola, two jolt and one turn-over molding machines and a 15-ton 38 ft. 5 in. span crane. New Erie and Buffalo & Susquehanna railroad sidings have been put in, and hereafter the firm will devote the entire plant, which includes a modern machine shop, to the manufacture of direct-driven gas-engine compressors for gas line work. The units will be of two cycle types up to 80 hp. and four cycle type for 100 hp. and over, up to 200 hp. In the foundry the firm has contracted for a period of four years to make all the gray-iron castings for the adjoining plant of the Kerr Turbine Company. F. A. Ansell is manager for Clark & Norton.

The Pennsylvania workmen's compensation board has ruled that a posthumous child of a man killed in the Central Iron & Steel Company's plant at Harrisburg, Pa., is entitled to compensation.

The Judson Mfg. Company is preparing to build a 30-ton open-hearth furnace at its plant in Oakland, Cal. A steel building 100 ft. square will be erected to house the furnace, charging machine, 40-ton crane, etc. The tack and nail department now occupying the site will be moved. Plans are under way to improve the rolling mill later.

ELECTRIC REVERSING MILLS

The Mills Built and Building—The Record at Hamilton, Ont.

On Tuesday evening, Oct. 3, Wilfred Sykes, general engineer of the Westinghouse Electric & Mfg. Company, East Pittsburgh, read a paper entitled "Electrically Driven Reversing Rolling Mills," before the mechanical section of the Engineers' Society of Western Pennsylvania. Mr. Sykes said in part:

The first successful installation of a reversing electric blooming mill was that of the Steel Company of Canada, at Hamilton, Ont. This installation consists of a double reversing motor capable of developing about 10,000 hp. maximum, and is supplied with power from a flywheel motor-generator set with two generators. This mill has been in operation for over three years with very satisfactory results. It is at present working at a rate considerably in excess of the capacity specified when it was installed. The following are particulars of the mill and driving equipment:

Size of ingot	15 by 17 in.
Weight	4000 lb.
Finished material	4 by 4 in.
Elongation	16
Number of passes	19
Capacity, tons per hour	60
Roll diameter	30 in.
Pinion diameter	34 in.
Speed, full motor field	70 r.p.m.
Speed, weakened motor field	100 r.p.m.
Driven from motor	Direct
Number of motors	2
Voltage across each armature	600
Maximum operating torque	900,000 ft. lb.
Maximum motor horse power	10,000
Number of generators	2
Rated power of driving motor of set	1800 hp.
Weight of flywheel	100,000 lb.
Speed of flywheel set	500 r.p.m.

The largest installation at present in operation is that of the Bethlehem Steel Company which drives the 35-in. blooming mill at the Lehigh plant.

The following is a list of electrically driven reversing rolling mills installed or building in the United States and Canada, 18 in all:

Mill	Horse-power	Started Operation
30-in. universal plate mill, Illinois Steel Company	8,000	1907
35-in. blooming mill, Algoma Steel Company	8,000	1913
34-in. blooming mill, Steel Company of Canada	10,000	1913
35-in. blooming mill, Bethlehem Steel Company	12,000	1915
34-in. blooming mill, Central Steel Company	8,000	1915
35-in. blooming mill, United Steel Company	12,000	Installed
40-in. blooming mill, Inland Steel Company	15,000	Building
32-in. blooming mill, Inland Steel Company	8,000	Building
28-in. structural mill, Inland Steel Company	8,000	Building
40-in. blooming mill, National Tube Company	15,000	Building
40-in. blooming mill, Illinois Steel Company	15,000	Building
35-in. blooming mill, Mark Mfg. Company	15,000	Building
27-in. universal plate mill, Mark Mfg. Company	8,000	Building
24-in. billet mill, Mark Mfg. Company	5,000	Building
24-in. flat mill, American Steel & Wire Company	3,000	Building
34-in. blooming mill, Ashland Steel Company	8,000	Building
34-in. blooming mill, Keystone Steel & Wire Company	8,000	Building
34-in. blooming mill, Chattanooga Steel Company	8,000	Building

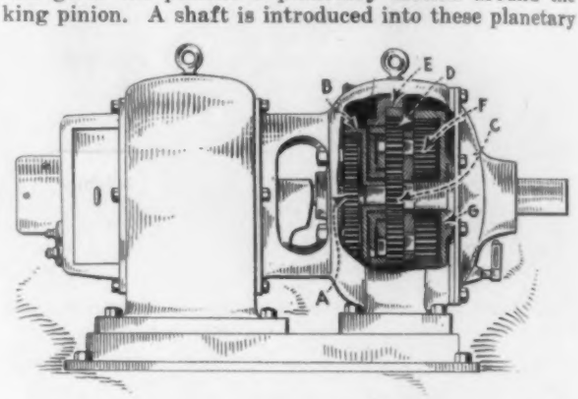
The question of maintenance is of great importance, and the figures given by Mr. Jefferies of the Steel Company of Canada, in a discussion at the convention of the American Institute of Electrical Engineers, showing the results obtained in their mill over a period of three years, are of interest. The figures for power consumption are also notable as they were obtained with the mill working much below its normal capacity.

Item	1913	1914	1915
Operating	9 months	8 months	12 months
Tonnage	119,283	92,622	174,460
Kilowatt-hours per ton	23.9	22.8	21.5
Repairs and maintenance	$924	$837	$700
Miscellaneous supplies	$420	$465	$525
Labor in operation	$1,680	$1,488	$2,275

Differential Speed Reducing Mechanism

The Foote Bros. Gear & Machine Company, 210 North Carpenter Street, Chicago, Ill., has placed on the market a double differential speed reducing mechanism of the all spur gear type. This differs from the company's standard type which has been on the market for some time. In the new device the first part of the mechanism is non-planetary and the second set is planetary, which it is emphasized, eliminates the objection to the high speed planetary set of idlers that were fastened to a flat plate and rotated around the high-speed shaft. Another advantage claimed for this arrangement is the ability to get a considerable speed reduction in a small space.

The first king pinion *A* is keyed directly on the motor shaft, which eliminates the flexible coupling between the motor and the speed reducing mechanism and also enables the connection to be made much shorter by using a thimble. This thimble connection is counterbored to go over the standard cover of the motor and forms a part of the front side of the reducer case. The first set of studs and idlers is rigidly fastened in the case and transmits motion from the king pinion to the internal gear *B* that is partly journaled on the slow-speed shaft. This gear is also supported at its outer edge by the hub on the planetary cage carrying the planetary pinion. A pinion *C* is rigidly fastened to the hub of the first internal gear which gives a planetary motion of the second set of idler pinions *D*. The outer periphery of these pinions meshes with the stationary rack *E* which is rigidly fastened in the case and gives the pinions a planetary motion around the king pinion. A shaft is introduced into these planetary



A Double Differential Speed Reducing Mechanism of the All Spur Gear Type in Which the High-Speed Set of Planetary Gears Has Been Eliminated

pinions and supports another set of idler pinions *F* that mesh with the last gear *G* which rotates the slow-speed shaft.

It is explained that this arrangement makes it possible to get a very large reduction in the last two sets of gears by having slightly fewer teeth in the last internal gear *G* than in the stationary rack *E*. For example, if the last internal gear has 60 teeth and there are but 59 in the stationary rack, the ratio in this pair is 59 to 1 which when multiplied by 5 to 1, the ratio of the first reduction gears, gives a total reduction of 295 to 1.

The Luxemburg iron manufacturers are reported to have extended their contract with the German Blast-Furnace Owners' Association until 1920. Up to 1910 the Luxemburg plants formed a joint association with the blast furnaces of the Lorraine district, and in 1911 some of them joined the German association, followed gradually by others. The question came up when the war started whether it was consistent with neutrality that the country's steel plants should supply materials to German munition plants. The Luxemburg Government was powerless to act but protests are heard from time to time in criticism of the cordial relations with German blast-furnace owners.

The Reading Iron Company, Reading, Pa., has increased the pay of its puddlers from $7 to $7.50 per ton, the highest rate ever paid in the Schuylkill Valley.

QUEBEC BRIDGE CASTINGS

Design in Itself Unsafe—Casting Probably Defective, as Others Stood Overload

Careful analysis of the evidence available bearing on the wrecking of the Quebec bridge center span tends to confirm the explanation already given of the cause of the failure. Although attributed to the breaking of the intermediate rocker casting at the southwest corner of the span, according to the *Engineering News* the specifications for the cast steel rockers, shoes, etc., were fully met by the metal furnished. Regarding the analysis of the steel and the foundry practice followed, that journal says:

The material was acid open-hearth, made by the Canadian Steel Foundries, Ltd. The test report from the foundry's laboratory shows for the chemical composition: Carbon, 0.26 per cent; phosphorus, 0.033 per cent; sulphur, 0.032 per cent; manganese, 0.55 per cent; and for test results: Elastic limit, 36,300 lb. per square inch; maximum strength, 69,700 lb. per square inch; elongation, 29 per cent; reduction of area, 44.7 per cent.

The heat from which the rockers were cast included other castings, and it is not known from which casting the test coupon was taken. Nor can the coupon be located now for examination of fracture and structure. However, the process of molding, pouring and annealing was carried out in exactly the same way as for other highest-grade castings. The melt was treated with 1265 lb. ferrosilicon and 525 lb. ferromanganese to 18 tons charged. The rockers were molded top down, bottom-gated, with four shrink heads taken off the sides of the top (the lower or longitudinal brackets) and rising 20 in. high above the casting. No welding or other curing of defects was done, it is stated very positively. Annealing was done at 1700 deg. to 1800 deg. Fahr., and according to best recollections these castings were in the furnace 36 hr.

Full approval on these points is also voiced by the *Engineering Record*, which states:

As to the castings, the tests and analysis of specimens leave no ground for criticism as to the character of the metal. The composition is up to the specifications; the strength and ductility very satisfactory. There were no rejections, and the inspection was careful. No details are available to show the history of the annealing; the usual practice of the Canadian Steel Foundries, Ltd., which furnished the castings, was followed.

A recent measurement of the chains of the southeast hanger, which received the full weight of that end of the span when it tore away from the southwest stirrup, shows an elongation of about ½ in. in each 30-ft. link, proving an overload on the castings at that point of at least 60 per cent. It has been established that despite such stresses the rocker here did not fail. Nevertheless the estimated load on each hanger of 3,000,000 lb., including 20 per cent allowance for impact, while sufficient for a stable load, did not allow an adequate factor of safety for a detail on which such tremendous possibilities for disaster rested. In this regard, the *Engineering Record* says:

The computations reveal an interesting condition. If the load were to be carried entirely in direct compression the stresses that would have developed in an intermediate casting without wings would be well within the limits of good practice. Manifestly the design of an intermediate member that would act only in compression was out of the question. Longitudinal stability was required not only during hoisting, but while the span was on the bents at Sillery Cove. But the addition of the longitudinal wings actually weakened the casting, or, to put it in a better way, required the casting to take bending stresses. These were limited by the designers (with their assumption of stress distribution) to 20,000 lb. per square inch. . . . These stresses are checked by an alternative assumption as to stress distribution. The factor of safety, however, it seems, was too low for a member in such a responsible position. . . . While, in the opinion of this journal, a higher factor of safety would have been advisable, the only conclusion that seems warranted is that the failure was due to a defect in the metal.

"Simply regarded," says *Engineering News*, "the 'stress calculation' for the Quebec rocker support is merely some formal and unimportant figuring to verify minor features of the design. It does not analyze or approve the design, but tacitly accepts the design as adequate and then deduces a few auxiliary figures from it. It is therefore chiefly significant as being an expression of complete faith in the trained eye and sound judgment of the designer who sketched out the proportions of the castings. Unfortunately that faith was not justified by the event."

Device to Prevent Motor Reversals

To guard against the serious results attendant upon alternating-current motor reversals, especially when these motors are installed in connection with elevators, hoists, conveyors, cranes, machine tools and textile machinery, the General Electric Company, Schenectady, N. Y., has developed a reverse phase relay. It operates on the same principle as a squirrel cage induction motor and is made in both circuit opening and circuit closing types. The interchanging of wires by power companies, as when repairs to cables are made, is a condition, for example, to be guarded against. The type of contacts required for any installation depends on the method of tripping out the motor switch. The operating coils of the relay correspond to the stator of an induction motor, while a hollow aluminum cylinder connected to the contacts corresponds to the rotor. The latter, however, does not rotate but moves either upward or down when one of the phases of the line is reversed. This movement causes the toggle to buckle and move the contacts.

A Reverse Phase Relay Which Opens the Circuit if the Phases Have Been Reversed and Thus Prevents Accidents Due to a Reversal of Motor Rotation

A Portable Light Hoist Using Manila Rope

For the use of Manila rope instead of wire rope for light hoisting and hauling a new model portable pneumatic hoist has been brought out by the Ingersoll-Rand Company, 11 Broadway, New York City. This hoist is essentially the same as the one illustrated in THE IRON AGE, Sept. 3, 1914, the main differences being the diameter and length of the hoisting drum, the width of the flanges and the main frame and over-all dimensions. Like the earlier type, either compressed air or steam can be used. The hoist has a drum 7 in. in diameter and 17 in. long with 5-in. flanges and will accommodate 300 ft. of ⅞-in. Manila rope. The capacity of the hoist is 600 lb. and the weight is 358 lb. The over-all dimensions of the hoist are length 21½ in., width 31¼ in. and height 23 in. Although designed primarily for underground work, the hoist can also be employed in industrial plants for all around hoisting and hauling.

A brief filed in the United States Supreme Court Oct. 2 by the Government against the Merchants & Manufacturers Association of Sacramento and the traffic bureaus of several other cities in California appeals from a decision handed down by the Federal Court for the Northern District of California officials to advance the case on the calendar for an early hearing because of its widespread importance. The original litigation, commonly known as the Pacific Coast Terminal case, was a suit brought to enjoin enforcement of certain orders of the Interstate Commerce Commission, which denied to inland California cities the same rates as were enjoyed by San Francisco and other ports on the Pacific. If the commission is reversed, it is believed the entire theory of the long and short haul clause of the act to regulate commerce may have to be revised.

Qualities and Defects of Steel Ingots*

Type of Mold for Bottom or Top-Cast Steel—Advantages of Using Tun Dishes for Top-Poured Metal

BY J. N. KILBY

NO place was until recently surrounded by a bigger wall of prejudice than the core of what has been called the hub of the steel trade, and with the exception of a few firms and individuals the clinging to oldest and routine process is to-day as strong as ever. Any suggested deviation from the beaten track usually brings forth the answer, "Our fathers built their trade on this method. It was good enough for them; it is good enough for us." Any sound point gained by experience admittedly must be retained, but it is also expected that methods which have no real value except their antiquity should be relegated to their proper place.

Brands of iron and mixtures have meant finality to a host of arguments upon the quality and defects in steel ingots. These may be very convenient when no other label can be found, but it is not conducive to improvement or economy. The virtue existent in the much cherished brands of iron is purely one of consistency and not of extraordinary chemical or physical properties.

Whether the steel is made from Swedish, West Coast, or East Coast materials matters not as far as pipe, segregation, and surface defects are concerned. These defects cover 90 per cent of those found in steel ingots upon which this and further papers will deal. Defects mentioned are caused by bad type of mold and methods of casting. Faulty casting and mold type are directly responsible for most of our present day tight-laced specifications. Engineers find in spite of restrictions upon the sulphur and phosphorus content and demands for huge discard, to be clear of pipe, that defects continually crop up; hence their firm conviction against relaxing their specifications.

BOTTOM AND TOP-CAST STEEL

Molds and beds of numerous types are used today in the making of bottom-poured steel. Some of the molds are absolutely unfit for the production of sound steel. Sketches A, B, C, D, E, F, G, H and I (Fig. 1) show various types of both top and bottom cast ingots, and the table describes them. These are not shown to scale, and are for illustrative and comparative purposes only. They are based upon the cutting up of a huge number of ingots some years ago. Later experience has fully confirmed them.

For bottom-cast steel the only type of mold which is reliable is the one cast wide end up, the steel feeding the ingot through the central nozzle in the mold bottom, the mold having a feeder head. The only type of bed is one which is radial, the ingots being equidistant from the feeding trumpet.

The type of mold most suitable for top-poured steel is the one wide at the top with feeder head. Steel cast direct from the ladle into the mold often cracks in rolling or forging, and is apt to produce unsound material. An 18-in. ingot cast direct may produce 3-in. billets, the defect being so fine as to escape ordinary inspection, and on first examination appear almost like superficial scratches. The pickling of such material would show up these defects, and also what a small percentage of top-poured steel is actually sound. The same ingot worked into, say, a 10-in. bar would yield as much unsound as sound material. The more "work" upon the steel, the more the defect is hid. It is present nevertheless. Top-poured steel is more liable to cracks than

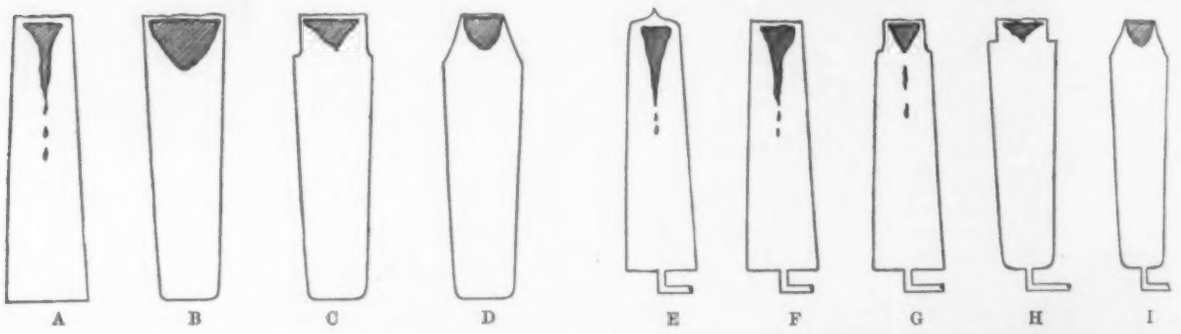


Fig. 1—Various Types of Top and Bottom Cast Ingots, Details of Which Are Given in the Table

Table of the Details of the Ingots Shown by Fig. 1.

Ingot	Type of Mold Used	Average Pipe and Segregate Zone	Surface	
A	Top poured, narrow end at top, no brick head, usual Bessemer mold.	Up to 50 per cent of the ingot. Liable to secondary pipe.	Cracks and splash.	Practically free from occluded fluxed brick.
B	Top poured, wide end at top, no brick head.	Up to 35 per cent of the ingot. Traces of secondary pipe.	Same as A.	Same as A.
C	Same as B, with brick top.	Under 12 per cent of ingot.	Same as A.	Same as A.
D	Same as B, with "sand" head.	Same as C.	Same as A.	Same as A.
E	Bottom-poured, narrow end at top, closed top.	Up to 80 per cent of ingot. Always has secondary pipe. Worst possible ingot for pipe and segregation.	Good.	Liable to occluded fluxed runner brick.
F	Bottom-poured, narrow end at top, no brick top, open at top.	Up to 60 per cent of the ingot. Always has secondary pipe.	Good.	Same as E.
G	Same as F, but with brick head.	Up to 40 per cent of ingot. Nearly always has secondary pipe.	Good.	Same as E.
H	Bottom cast, wide end at top, adjustable brick head.	Under 10 per cent. No secondary pipe.	Good.	Same as E.
I	Bottom-cast as H, but with "sand" heads.	Same as H.	Good.	Same as E.

*From a paper presented at the autumn meeting of Iron and Steel Institute in London, England, Sept. 22, 1916.

bottom-poured steel on account of the quick rate the mold is filled. Hot steel, of course, yielding worse than that cast at a moderate temperature.

Temperature of the steel depends a good deal upon the workman, who is liable to err on the high

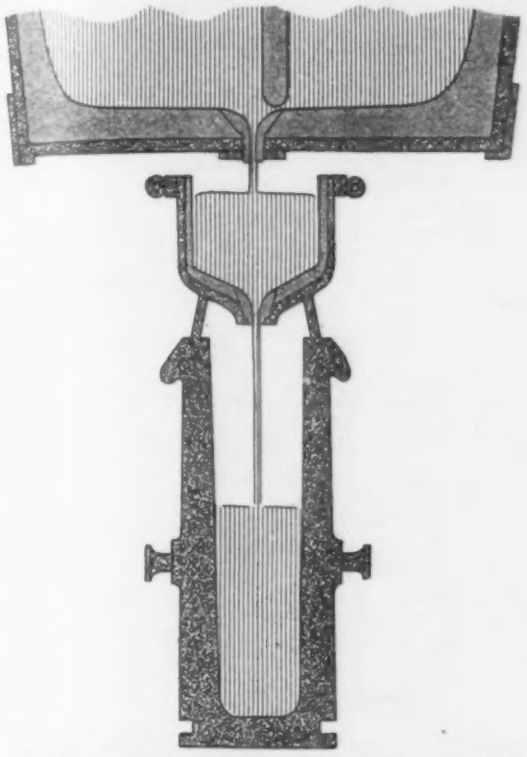


Fig. 2—The Application of a Tun Dish as Recommended for Top-Pouring Steel Ingots. The metal passes from the ladle through the dish to the ingot

side. This is natural, seeing that he is usually paid per ton of ingots, and not upon the yield of sound material in the mill or forge. The difference in temperature between what is termed a "hot cast" and one which runs nicely is not so great as is often supposed. No professor has yet been able to demonstrate or even lay out any definite lines for the maker to work upon. Harry Brearley's paper before the West of Scotland Institute is about the only practical paper aiming in this direction and illustrative of the effects of temperature.

TUN DISHING FOR TOP-POURED STEEL

To obtain the best results from top-poured steel the material should not be cast from the ladle into the mold direct, but should pass through a secondary ladle or tun dish attached to the ladle or resting upon the molds as illustrated by Fig. 2. It may be a dish containing one or more nozzles according to the tonnage to be cast and the nozzle or nozzles in the large casting ladle. The different types are shown by Fig. 3. If tun-dishing is carried out thoroughly, the quantity of ingots suffering from cracks while being rolled or forged is reduced to a minimum.

A number of firms have tried this method of top-casting steel; some have been highly successful, others have unfortunately not had this success. Failure in this class of work is brought about usually by expecting to do too much at once. The size or relative values of nozzles are not taken sufficiently into account, neither is the personal factor of the workmen. Steel does not require to be excessively hot to be cast in this manner. The effect of mold shape and ratio of cross-sectional area to length have influences upon the ingot produced.

Large Orders for Turbines

Orders totaling more than $2,700,000 have recently been received by the Westinghouse Machine Company, East Pittsburgh, Pa., for equipping with propelling machinery 44 merchant ships, now under construction or contracted for at the yards of shipbuilding companies on the Atlantic and Pacific coasts. The company also has in immediate prospect the equipping of 16 merchant ships in addition to the 44 above mentioned, bringing the total number of ships up to 60 and the total value of the orders for machinery to be supplied by the Westinghouse Machine Company to approximately $3,750,000. The ships are to be equipped with the latest refinements in the line of propelling machinery, consisting of Westinghouse turbines with double reduction gears and, with few exceptions, condensing equipment. The first ship which has been so equipped is the Malmanger, launched at the yards of the Chester Shipbuilding Company, Chester, Pa., on Aug. 26.

The business above described covers strictly merchant ships and does not include orders received for propelling machinery for the United States Navy or for foreign governments.

New Iron and Steel Plant in China

The Han-Yeh-Ping Iron & Coal Company, Ltd., Hanyang, China, has begun the erection of a new iron and steel plant at Tayeh, about 20 miles from its iron-ore mines. The site consists of about 670 acres. The new plant will start with two blast furnaces, of 400 tons daily capacity each, with necessary equipment, and will eventually be extended to comprise eight blast furnaces, with sufficient open-hearth steel furnaces and rolling mills to convert the blast-furnace production into finished products. The contract for the first two blast furnaces was last year awarded to the Riter-Conley Mfg. Company, Pittsburgh, but some delay ensued owing to a misunderstanding between that company and the agent of the Chinese company. Matters have now been adjusted, and it is expected that the material for the furnaces will be delivered by the end of this year. Some of the auxiliary machinery has been ordered from England and electrical apparatus from the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa. The program of erection contemplates the blowing in of the furnaces early in 1918.

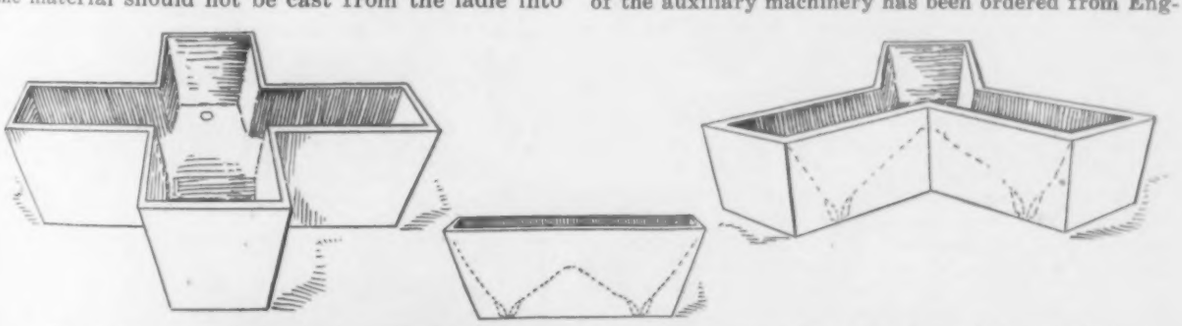


Fig. 3—Types of Tun Dishes Recommended for Top Pouring Two, Three or Four Ingots from the Same Ladle

Forty-four White motor trucks, working for eight different contractors or building material companies, have hauled over 60 per cent, it is estimated, of the thousands of tons of materials used in the construction of Cleveland's new $4,000,000 high level bridge.

POWER IN COLD-ROLLING

Formulas for Ascertaining Horsepower Requirements—Investigations Necessary

The action of a rolling mill in the cold rolling of metal was analyzed in the *Engineer* of London, England, Aug. 18, 1916, by C. E. Davies, in an attempt to outline a theory governing the consumption of power in the process. As there are no great number of experimental data on the subject, the formulas developed are largely empirical, but they indicate the direction that experimental investigation should take, and they also show broadly the main factors controlling the demand for power in the rolling mill. The analysis was confined to cold rolling, for while the same general principles would apply, the introduction of the temperature factor would render the application of the theory a complicated matter.

In developing his theory the author uses the analogy of a press for the reduction of the section of an ingot, considering the rolling mill as a continuous press. The work done by the rolls in reducing the thickness of the metal is the same as it would be if applied by direct pressure under a press where the vertical load sufficient to overcome the resistance of the metal to displacement is distributed over the whole area and exerted through a distance equal to the amount of reduction effected. While the action of a press would cause the metal to flow equally in all directions at right angles to the line of applied pressure, the reasoning is in no way affected if it is assumed that the flow takes place in one direction only, that is in the direction of the line of travel of the piece between the rolls in the rolling mill. The load per square inch necessary to produce flow varies with the relative amount of compression effected, and must here be considered as the average between the maximum and minimum pressures at the beginning and end of the compression respectively.

By a process of mathematical reasoning that it is not necessary to repeat here the author develops the following formula for the horsepower required to drive the mill, the actual displacement of the metal alone being considered:

$$\text{Hp.} = \frac{F_c \frac{L}{2} (1 + X) B \frac{t_1 - t_2}{12}}{33{,}000}$$

in which F_c is the resistance of the metal to crushing up to the point where flow begins, in lb. per sq. in.; L is the length of the piece before rolling; B the width of the piece, and t_1 and t_2 the thickness of the piece before and after rolling, all in inches, and X is the ratio of $\frac{t_1}{t_2}$. It is assumed that the width of the piece is unchanged by rolling, all variation in dimensions being in the length and thickness. This formula may be transformed into another in which the speed of the rolls is a factor as follows:

$$\text{Hp.} = \frac{F_c R N B d}{63{,}024} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

in which N is the number of revolutions per minute; R the radius of the roll barrel in inches, and d, the reduction or "pinch" $= t_1 - t_2$

A large proportion of the power delivered to the rolling mill is lost in friction. Ignoring the losses in the driving gear, pinions, etc., the power lost in the roll bearings will be found to be a quantity dependent with any given speed and roll dimensions on the vertical pressure necessary to effect the desired reduction. All power supplied to a rolling mill, both that employed in reducing the section of the metal and that lost in bearing friction is converted into heat, which must be continually dissipated. Part of this is carried away by the rolled metal and part by water circulation, the remainder disappearing in the form of radiation from the roll surfaces and mill frame.

The horsepower absorbed in the roll friction is expressed by the formula

$$\frac{\sqrt{Rd}\, B F_c \mu r N \times 2}{63{,}024} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

μ being the coefficient of friction of the roll bearings, and r the radius of the roll necks, in inches. The value of r is usually proportional to R and may be expressed as xR, the value of x being generally put at 0.7. Formula 2 may then be combined with formula 1 to give the value for the total horsepower required for driving rolls. The combined value would be

$$\text{Hp.} = \frac{Rb F_c N}{63{,}024} (d + \sqrt{Rd}\, \mu \times 2) \quad \ldots\ldots\ldots (3)$$

It is evident that for any rolling mill with rolls running at a given speed the total horsepower required is proportional to the term within the parenthesis in formula 3. The useful work done in reducing the thickness of the metal is directly proportional to the "pinch" d, expressed in inch units, while the frictional work is more complex and depends on the coefficient of friction of the bearings.

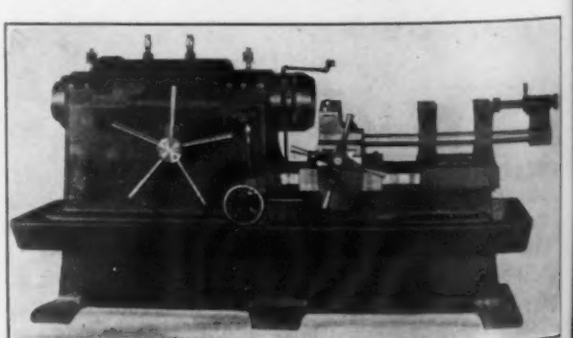
Of the various factors entering into the problem it is only resistance of the material to crushing and the bearing frictional losses which are difficult to determine. Constants for these can be determined by a set of careful experiments, but there are at present no reliable data on which to work. It is possible, however, to assign approximate values to F_c and μ which will render the formula useful for arriving at a sufficiently reliable estimate of the power required by a rolling mill for any given duty. Such researches as have been made indicate the value of the coefficient μ decreases with increase of pressure. On the other hand, the conditions of lubrication are poor and for approximate calculations of the power required, it is advisable to assume a rather high value for this coefficient. About 0.05 would seem to give results which agree with practice.

Resistance of any metal to crushing under the conditions that are present in a rolling mill is not a constant quantity, but is dependent on the amount of reduction effected proportionate to the original thickness of the material. In the calculations, the resistance to crushing F_c has been taken as an average value for the specified reduction and as uniform over the projected area of the roll which is in contact with the metal. While this assumption does not materially affect the accuracy of the results, it should be borne in mind that F_c is not a constant for any particular metal or alloy, but is a variable proportional in some way to the ratio $d \div t$. The first step, therefore, in attaining greater accuracy in the solution of the problem must be in the direction of careful research into the resistance to crushing of the various metals and alloys under varying degrees of compression, thus obtaining the necessary data without which no close estimate of the power required by rolling mills for any given duty is possible.

Geared Head Cutting-Off Machine

A new cutting-off machine designed for solid or tubular stock up to 6 in. in diameter has been brought out by the Etna Machine Company, Toledo, Ohio. This is a geared head machine with four spindle speeds. It is designed for operation at from 100 to 110 ft. per minute on various sizes of stock and is driven either by a constant-speed motor or by single belt from the line-shaft. The control is by a friction clutch having a lever within easy reach of the operator.

The collet has a 5/16-in. opening and automatically



A Geared Head Cutting-off Machine for Solid or Tubular Stock Having Four Spindle Speeds

adjusts itself to the different sizes of stock. It is operated by a large pilot wheel on the front of the machine. All of the working parts of the head and collet are inclosed and run in oil.

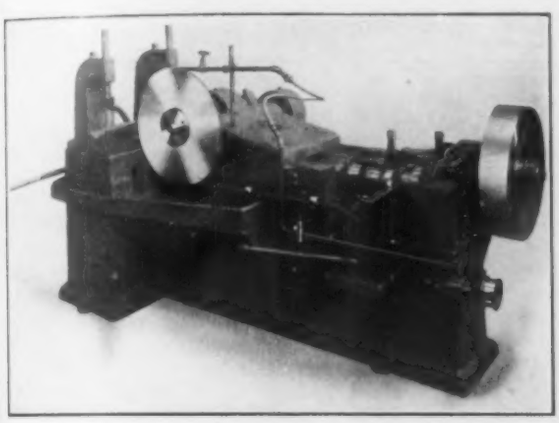
The cutting-off tool is placed at an angle of 15 deg. and is 3/16 x 1 in. in size. The cutting-off slide is adjustable longitudinally by means of a handwheel and screw. The diameter of the push tube is 6⅜ in.

The machine is equipped with a large stock support which contains a stop provided with a cam to back it away after the stock commences to revolve. Lubricant for the cutting tool is supplied by a geared pump.

The machine is 114 in. long, 64 in. wide including motor bracket, 32 in. high and weighs 7900 lb.

Small Size Cold Metal Sawing Machine

For handling round stock up to 5½ in. in diameter the Newton Machine Tool Works, Inc., Philadelphia, Pa., has built a small size of cold metal sawing machine. It has a geared feed in place of one of the friction type.



Cold Metal Sawing Machine for Solid Stock up to 5½ In. in Diameter or Combinations of Small Stock of Equivalent Section in Which a Geared Feed Has Replaced the Friction Type

The machine is of the spindle-driven type. The spindle revolves in capped bearings and is driven by spur gears which receive their power from a worm and wormwheel. The former is fitted with roller thrust bearings and the wormwheel is of solid bronze. A saw blade 20 in. in diameter of either the solid or inserted high-speed type is used. The saddle has underlocking gibs which are cast solid with it. Vertical and horizontal adjustments are made by taper shoes. A fast power return is provided for the saddle in addition to a gear box which provides the necessary changes without removing gears. Trips to stop the feed at any predetermined point are fitted to the saddle together with safety stops for each extreme of its travel.

As to the gear feed, it is pointed out by the builder that a friction feed that is powerful enough to advance the blade will not prevent the blade from breaking and will also wear the blade to pieces by simply rubbing against the stock. It is also emphasized that it is not the feed that breaks the teeth, but the metal choking the teeth that causes trouble.

Provision is made for supplying lubricant to the point at which cutting is being done, the equipment including a pump, piping and the necessary attachments. The lubricant tank is located inside the base of the machine at the rear and oil pans cast solid with the base are provided to return the used lubricant.

In tests made of this machine it has been possible to cut off a piece of 0.50 per cent carbon stock 6 in. in diameter in 3 min. The machine is not designed, however, for a feed greater than 1 in. per minute.

The Jeffrey Mfg. Company, Columbus, Ohio, has opened an agency with the Gustin-Bacon Mfg. Company, Kansas City, Mo. J. S. Davidson, who has spent several years in the sales and engineering departments of the Jeffrey Company, has associated himself with the Gustin-Bacon Company.

WASTE FOUNDRY SAND

Wisdom of Re-using—How Sometimes Disposed of—Burnt Core Sand

To ascertain how best to dispose of waste foundry sand, a set of ten questions was sent out to foundrymen by H. B. Swan of the Cadillac Motor Car Company, Detroit. A summary of the answers to these questions was given in a paper by him read before the American Foundrymen's Association at Cleveland, Sept. 12, 1916. From this the following notes are abstracted:

In general, no attempt is made to re-use burnt core sand, while in a number of cases old molding sand is treated for re-use. In the great majority of cases the old sand is carted to the dump at an expense which varies with the location of the foundry and the methods available for handling it. Mechanical means of handling new and waste sand will often cut the net cost of sand 50 per cent.

Some foundries have used refuse sand for concrete mixtures, with good results. It is well adapted for such use in foundations and similar structures, and has even been used in sidewalks, although there has been some flaking of the surface due to the flour in the cores. In one case the sand has been used as a filler for fertilizer.

The personal experience of the author has been, in attempting to use burned sand in new core sand mixtures, that the cores are weak, soft, require an excessive amount of binder, and do not resist the action of the metal well. Even after burned sand has been washed and cleaned, if examined under the microscope it will be found that the individual grains are coated with a black carbonaceous residue. These absorb an excessive amount of binder and where seacoal has been used either in facing sand or in the core sand mixture, this has been coked and it is impossible according to his experience to wash it all out. It must also be borne in mind that nearly all foundry sands contain a small amount of alkalis which are inimical to oil binders.

In a contribution to the same paper, Henry M. Lane, consulting engineer, Detroit, pointed out that a washing or dry cleaning process which would remove the burnt clay and fine sand dust would make possible the re-use of a large percentage of the burned sand. A number of patents have been taken out for dry cleaning systems, these ranging all the way from a thorough scouring to simple removal of the fine dust.

According to Mr. Lane, from a commercial standpoint the process which will produce a product, just good enough for use, at the lowest cost, is the one that will ultimately be used, even if other systems may give a better, though more expensive, product. In steel foundry practice the ultimate factor is the cost of a ton of finished castings, and a process which recovers, say, 80 per cent of the sand in a fairly usable condition may be better than the one which recovers 90 per cent in a better condition but at a higher cost.

Furthermore, continued Mr. Lane, at least 80 per cent of all waste sand material shipped out of the ordinary foundry can be recovered for re-use in some form. In the case of heavy gray iron work it can be dry cleaned, rebonded with the proper kind of clay, and used as heavy-work molding sand. In the case of aluminum and brass work the general run of sand from the foundry can be cleaned and used in core work with resin or water soluble binders. It, however, does not work well with oil. For the thorough cleaning of certain classes of sand, the wet process seems to be the best, but this necessitates first a scrubbing and then a washing, and takes quite a complicated plant, though the actual cost of cleaning per ton is low.

National Founders' Association to Meet in New York City Nov. 15 and 16

The National Founders' Association will hold its twentieth annual convention at Hotel Astor, New York, on Wednesday and Thursday, Nov. 15 and 16. The convention banquet will take place on Wednesday evening, Nov. 15.

Death of Col. R. C. McKinney

With the death of Col. Robert Cochran McKinney, chairman of the board of directors of the Niles-Bement-Pond Company, passed a pioneer of the machine-tool industry and the creative genius to which the great manufacturing company with which he was connected owed its existence. As stated in THE IRON AGE, last week, Colonel McKinney died at his home at Belle Haven, Conn., Oct. 3, following a protracted illness. Although he had not been in good health for two or more years, he nevertheless had been in his office frequently in that period.

It has been said that the Niles-Bement-Pond Company identified and illustrated the life career of Colonel McKinney, and to those who knew him and of his activities the statement is entirely within bounds. From its organization until his death his life was practically that of the company, although latterly others of sturdier vitality had charge of its active affairs.

COL. R. C. M'KINNEY

Colonel McKinney was born at Troy, N. Y., 65 years ago. In 1861 his parents removed from Troy to Cincinnati, where he attended the public schools and Woodward High School until 18 years of age. In the early seventies he took a partial course in mechanical engineering at Cornell University. His student life was followed by employment in the drafting room and office of a company which manufactured steam pumps at Hamilton, Ohio. In 1877 he became associated with the Niles Tool Works at Hamilton, which was the first plant of its kind established and operated west of Philadelphia. At the time, the country was just recovering from the disastrous effects of the panic of 1873, and financial conditions were still somewhat chaotic. Within two years he was appointed secretary of the company, and a little later made treasurer and general manager.

Under his management the business of the Niles Tool Works expanded to such an extent that a reorganization and additional capital were found imperative, and the capital stock was increased to $2,000,000. His title of colonel was gained while with this company, through his service on the staff of Governor Bushnell of Ohio. In line with the expansion of the company, the plant and business of the Cope & Maxwell Mfg. Company, whose product was steam pumps, were purchased, although later this company was sold to another corporation and became a part of the International Steam Pump Company. Throughout this period Colonel McKinney visualized the future of the machine-tool industry and his plans bore fruit in 1898 when the first step toward the present great corporation was taken through the purchase of control of the Pond Machine Tool Company, Plainfield, N. J., this purchase being supplemented by options on the works of Bement-Miles & Co., Philadelphia, and the Philadelphia Engineering Works. From these beginnings evolved the company which was incorporated in 1899, which owns the companies named, and owns or controls the Pratt & Whitney Company, Hartford, Conn.; the Pratt & Whitney Company of Canada, Ltd.; the Milwaukee Machine Tool Company, John Bertram & Sons, Ltd., Dundas, Ont., and the Ridgway Machine Company, Ridgway, Pa.

In February, 1915, Colonel McKinney relinquished the active work of the presidency, being succeeded by James K. Cullen, but was made chairman of the board. He was one of the founders of the Machinery Club of the City of New York, and was made first vice-president at the time of its organization. He was the second president elected, and a director at the time of his death. He was a member of the American Society of Mechanical Engineers, the Union League, Lotos, Engineers' and Cornell clubs of New York, the Hartford Club of Hartford, and Queen City Club of Cincinnati.

Philadelphia Bourse Studying Metric System

The Philadelphia Bourse is conducting an inquiry among manufacturers and exporters of Philadelphia and nearby industrial centers as to the extent to which they must use the metric system in foreign business and their attitude toward its general adoption in the United States. Early results indicate, it is stated, that "such a change is favored by progressive concerns. A number of these held that the adoption of the metric system is essential to our growing foreign export trade and that it would simplify and facilitate domestic business."

The statement includes the following opinions:

A. N. Hargrave, foreign sales manager of the J. G. Brill Company, car and truck builders, Philadelphia: "We are fully in accord with the agitation for the universal adoption of the metric system in export trade and in point of fact consider it advantageous as applied to domestic trade. During the last two years we have received quite a number of export orders which we have executed entirely in the metric system. The procedure is simple and advantageous, and we consider it far more satisfactory than converting the metric system into feet and inches."

N. C. Bradley, assistant superintendent, Midvale Steel Company, Nicetown, Philadelphia: "One of our shops is now working under the metric system. * * * We occasionally have work which is produced under the metric system and we believe that if it could be adopted universally it would be an improvement over our present system."

Schuylkill Forge Company, forgings, Philadelphia: "We believe that the general adoption of the metric system in the United States would be a good thing and that it would greatly facilitate our dealings with foreign countries."

Tindel-Morris Company, Eddystone, Pa.: "We do not manufacture for the export trade directly, but are frequently called on to manufacture crankshafts for automobiles and gas and oil engines, the dimensions of which are given in the metric system. Our shop men, after some experience, approve this system."

It is announced that a new steel foundry will be established in Ravenna, Ohio, by interests that have concluded negotiations with the Ravenna Chamber of Commerce for a site. It is stated that the plans contemplate one building 41 x 160 ft., for a steel foundry for light castings, and another building, 90 x 160 ft., for the manufacture of heavy steel castings and chilled and sand rolls.

The 1917 business of the Goodyear Tire & Rubber Company, according to the forecast made at a sales conference held at Akron, Ohio, indicates that 6,000,000 tires will represent the 1917 production and in Neolin soles a production of 25,000,000 pairs is expected.

Chairman Schwab and President Grace Entertained

Charles M. Schwab, chairman, and Eugene G. Grace, president of the Bethlehem Steel Corporation, and a number of other iron and steel manufacturers were guests at a noon luncheon of the Lebanon, Pa., Chamber of Commerce, and at the annual dinner of the Harrisburg, Pa., Chamber of Commerce, the afternoon and evening of Oct. 2.

Mr. Schwab and his party were met at Lebanon by a reception committee, which included George F. Speaker, president of the Chamber of Commerce, and B. Dawson Coleman, James Lord, John Penn Brock, E. R. Coleman, Frank B. Dutton and Lloyd Wolfe. At the Lebanon Club, at 1.30 p. m., Mr. Schwab, Mr. Grace and a number of others spoke.

The Bethlehem officials then went to Harrisburg and were met by a committee from the Chamber of Commerce and taken on an automobile inspection trip of the city. The banquet in the evening was held in the Masonic Temple. Nearly 500 were present. Addresses were made by Mr. Schwab, Mr. Grace, Quincy Bentz, general manager of the Steelton plant, and others. Mr. Schwab paid a glowing tribute to President Grace, whom he declared to be "at the very head of the steel industry in the world to-day," and predicted that the greatest growth of the steel industry would hereafter be in the East, because of its proximity to the sea and the fact that the Lake ores will eventually be exhausted, while the East has access to great deposits accessible by sea. Mr. Grace outlined the plans of the Bethlehem interests to spend $90,000,000 in improvements within the next three years and announced a number of changes at Steelton. The company store there will be divorced from the steel plant and all real estate interests would be transferred, he said.

Bethlehem's Great Gun-Proving Grounds

The greatest gun-proving plant in the world is to be established at May's Landing, a few miles from Atlantic City, N. J., by the Bethlehem Steel Company, primarily for the use of the United States Government. The company has purchased a tract of land comprising 20,000 acres, nearly 18 miles long and from 3 to 6 miles wide. Nearly a million dollars has been spent in acquiring the land and another half million will have to be expended before proving can be begun. The tract is as level as a floor. It is bounded on two sides by the Great Egg Harbor and Tuckahoe River, while a fine State boulevard extends along a third side and an electric railroad on the other.

The situation of the proving ground makes it possible that, in the event of war with a sea power, which would attack the Jersey coast between New York and Philadelphia, the Government could establish thereon a military base. With a little dredging, the inlet and the large bay could be made navigable for warships, while interior coast waterways connect with New York Harbor and the Delaware River.

The Edgewater Steel Company

The Edgewater Steel Company, Oakmont, Pa., near Pittsburgh, whose incorporation has already been noted in these columns, has completed the details of its organization and has taken over the entire plant of the Kennedy-Stroh Corporation. The plant is now equipped with one open-hearth furnace and another will be added, work on which will be started in a short time. In addition to carrying on the former lines of manufacture in steel and brass, new construction is now under way to give this company a well equipped plant for the manufacture of locomotive and carwheel tires, rolled steel wheels, gear rims, roll shells and turbine rings. F. B. Bell is president; M. R. Jackson, vice-president; W. H. Schoen, treasurer; J. H. Baily, secretary, and F. C. Riddile, general manager. The directors are Charles T. Schoen, E. W. Mudge, Maurice Falk, William L. Jacoby, E. T. Weir, Leon Falk, W. H. Schoen, M. R. Jackson, C. M. Thorp, J. H. Baily and F. B. Bell. The general offices of the company will be in the Farmers Bank Building, Pittsburgh.

NATIONAL RESEARCH COUNCIL

Engineering Foundation Gives Funds to Help Solve War and Peace Problems

Arrangements have just been completed whereby the resources of the Engineering Foundation, under the auspices of the four principal national engineering societies, are placed at the disposal of the National Research Council, which was appointed by the National Academy of Science at the request of President Wilson. The object of the council is to co-ordinate the scientific research work of the country in order to secure efficiency in the solution of the problems of war and peace. The council was without funds until the Engineering Foundation, established to further scientific and engineering research, offered to place its resources at the council's disposal, including the services of its secretary, Dr. Cary T. Hutchinson, to act as secretary of the council. The offer was accepted and plans for immediate activities have been placed in the hands of an executive committee.

Dr. George E. Hale, director of the Mount Wilson Solar Observatory, is chairman of the council. Medicine is represented on the council by Dr. William H. Welch, president National Academy of Science; by Brig.-Gen. William C. Gorgas, surgeon general of the United States Army; by Dr. Simon Flexner, director of the Rockefeller Medical Institute, and by Dr. Victor C. Vaughan, past president of the American Medical Society. Chemistry is represented by Dr. A. A. Noyes, Massachusetts Institute of Technology, and Dr. L. H. Baekeland; physics by Dr. A. A. Michelson of the University of Chicago; and electricity by Prof. M. I. Pupin, Columbia University. Clemens Herschel, president American Society of Civil Engineers; John J. Carty, chief engineer American Telephone & Telegraph Company; Gano Dunn, president J. G. White Engineering Corporation; C. E. Skinner, director of the research laboratory of the Westinghouse Company, and Dr. W. R. Whitney, director of the research laboratory of the General Electric Company, are among those who will represent the engineering side of the council's work.

The important military aspects will be presented to the council by Maj.-Gen. William Crozier, chief of ordnance U. S. A., by Lieut.-Col. George O. Squier, chief of aviation, U. S. A., and Chief Constructor David W. Taylor, U. S. N. Other branches of the government are represented by Dr. S. W. Stratton, director Bureau of Standards; Van H. Manning, director Bureau of Mines and Prof. Charles F. Marvin, chief United States Weather Bureau.

Other members of the council are: Dr. John A. Brashear, Pittsburgh; Dr. W. F. M. Goss, dean of engineering, University of Illinois; Dr. William H. Holmes, curator United States National Museum; Dr. W. W. Keen, president American Philosophical Society; Prof. E. C. Pickering, director Harvard College Observatory; Charles F. Rand, president United Engineering Society; Prof. Theodore W. Richards, Harvard University; Prof. R. A. Millikan, University of Chicago; Ambrose Swasey, Cleveland; Dr. Elihu Thomson, Swampscott, Mass.; Dr. C. R. Van Hise, president American Association for the Advancement of Science; Dr. Charles D. Walcott, secretary Smithsonian Institution; Dr. J. M. Coulter, professor of botany, Princeton University; Prof. R. H. Chittenden, dean Sheffield Scientific School, Yale University; Prof. Raymond Pearl, biologist, Maine Experiment Station, Orono, Me.; M. T. Bogert, professor of organic chemistry, Columbia University.

A souvenir gold dollar, specially minted by the U. S. Treasury Department in connection with the new McKinley Birthplace Memorial now in course of erection at Niles, Ohio, where the martyred president was born, is now ready for distribution. It has on one side a likeness of McKinley and on the other a bas relief of the magnificent memorial building. These coins, of which no more will be minted, will be sold at $3 each, and may be obtained from the leading banks in the principal cities, or from the McKinley Birthplace Memorial Association, Youngstown, Ohio.

SUPPLIES OF FERROMANGANESE

Apparent Supply Still Large and Adequate—Manganese Ore Imports a Record

The output of manganese-iron alloys made in the United States since the war started reached its height in June, 1916, when 41,278 gross tons were made, according to the blast-furnace reports of THE IRON AGE. The largest previous total was 35,844 tons in May. These figures are corrected to date. Since June there has been a gradual decline. The output in September was 29,551 tons of ferromanganese and spiegeleisen. The present average monthly output of 31,411 tons, however, is very much larger than that for 1915, which was 19,985 tons per month, and exceeds by over 11,000 tons per month the rate for 1913, the record year.

PRODUCTION OF MANGANESE-IRON ALLOYS

The following table, compiled from the monthly blast-furnace figures of THE IRON AGE, shows the combined and relative output of these alloys for the last four years and to date this year:

Production of Ferromanganese and Spiegeleisen in the United States—Gross Tons

	Ferromanganese and Spiegeleisen	Average per Month	Ferromanganese	Spiegeleisen
1912	244,884	20,407	125,378	119,506
1913	245,576	20,464	119,495	126,081
1914	206,448	17,204	106,083	100,365
1915	239,824	19,985	146,542	93,282
1916 to Oct. 1	282,699	31,411*	146,702	135,997

*At this rate the 1916 output will be about 376,932 tons, consisting of 195,605 tons of ferromanganese and 181,327 tons of spiegeleisen.

These figures show that the output this year of the manganese-iron alloys will approximate 377,000 tons if maintained at the present monthly rate. Our last analysis, published in THE IRON AGE, June 15, 1916, showed the monthly output to May 1, 1916, to have been 29,167 tons with the ferromanganese production at 16,110 tons per month and the spiegeleisen at 13,056 per month. The ferromanganese output has changed but little—16,300 tons to Oct. 1, 1916—but the spiegeleisen production has advanced from 13,058 tons per month on May 1, 1916, to 15,110 tons per month to Oct. 1, 1916.

IMPORTS OF FERROMANGANESE

The imports of ferromanganese have fallen off slightly in the last 5 months. To May 1, 1916, they were 25,898 gross tons or 6474 tons per month. The imports in July were 5341 tons and in August 8525 tons. The average to Sept. 1, 1916, had fallen to 6086 tons per month as the following table of Government data shows:

Imports of Ferromanganese into the United States

	Gross Tons	Per Month, Gross Tons
Total for 1915	55,201	4,600
Total for 1913	128,070	10,672
Total for 1916 to Sept. 1	48,687	6,086
Total for 1916 at this rate	73,031	6,086
Average per year for 5 years (1910 to 1914)	100,793	8,399

The present import rate is about 60 per cent of the record rate in 1913 and nearly 32 per cent larger than that of 1915. It is about 72 per cent of the 5-yr. average. Receipts in September from two of the ports which have thus far furnished THE IRON AGE with their imports amount to 7792 tons. It is therefore likely that the total imports for the year will not fall below 75,000 tons.

BRITISH AND AMERICAN MANGANESE ORE SUPPLIES

British imports of manganese ore thus far this year have been very good. To Sept. 1 the total has been 306,005 gross tons or 38,250 tons per month. Comparative official figures are as follows:

	Gross Tons
Imports per month in 1913	50,098
Imports per month in 1914	39,953
Imports per month in 1915	31,443
Imports per month to Sept. 1, 1916	38,250

The imports have gradually increased during 1916, having been only 33,049 tons per month to May 1, 1916, at the time of the last analysis of the situation.

Manganese-ore imports into the United States now are larger than ever before. To Aug. 1, 1916, they averaged 45,566 gross tons, those for July having been 81,942 tons and for May 74,825 tons. Comparative Government statistics are as follows:

Manganese-Ore Imports into the United States

Period	Gross Tons	Per Month, Gross Tons
1915	320,782	26,731
1914	283,294	23,608
1913	345,090	28,757
Average for 5 yr. (1910-1914)	269,649	22,470
To April 1, 1916	51,545	17,181
To Aug. 1, 1916	318,965	45,566
Total for 1916 at present rate	501,239	45,566

It will thus be seen that the imports thus far reported this year are but little short of the total for 1915, and not far from double the pre-war monthly record in 1913. Should the import rate be maintained at the present average for the remaining four months of this year the total will be 501,239 tons, an amount never reached before. Most of this has come from Brazil, the supply from our own country being negligible. Before the war but 20 per cent of our supply came from Brazil, the remainder coming from Russia and India, now practically shut off.

Early this year a considerable amount of manganese-iron alloys with a manganese content between 25 per cent and 75 per cent was being made and eagerly consumed, demanding a high price. At present these are not made in so great a quantity. The demand is less because the supply of the standard alloys is larger.

SUMMATION OF THE DATA

Summarizing the foregoing tables and taking the sum of the importations and the production of the standard 80 per cent ferromanganese as the apparent available supply for consumption, we have the following:

Apparent Supply of Ferromanganese in the United States

Period	Imports Gross Tons	Production, Gross Tons	Apparent Supply Gross Tons	Apparent Supply, per Month, Gross Tons
1912	99,137	125,378	224,515	18,709
1913	128,070	119,495	247,565	20,630
1914	82,217	106,083	188,300	15,691
1915	55,201	146,542	201,743	16,812
Average for 5 yr., 1910 to 1914	100,793	99,363	200,156	16,679
1916	75,000*	195,605*	270,605*	22,550*

*Probable figures based on the monthly returns to August and September this year.

These figures show that there has been very little change in the general situation since the review in THE IRON AGE, June 15, 1916, which showed an apparent supply for 1916 of 271,008 tons or 22,584 tons per month, at the rate of importation and production then. It is not only considerably larger than the 5-year average up to 1915, but is 2000 tons per month in excess of the apparent monthly supply in 1913, the pre-war record.

The striking and significant fact is that, at the present large production rate, an output in 1916 of nearly 196,000 tons of standard ferromanganese is assured. This contrasts with the previous record production before the war of 125,378 tons in 1912 and of 146,542 tons in 1915.

APPARENT SUPPLY AND CONSUMPTION

The relation of the probable apparent 1916 supply to that of the present needs of the American steel industry is an important one. While somewhat conjectural, comparatively reliable estimates are possible. The estimated steel output of all kinds in the country on Jan. 1, 1916, was 40,000,000 gross tons per year, and on June 1, about 44,000,000 tons. Recent new capacity now in operation or to be producing by Dec. 31, 1916, will bring the output to at least 45,000,000 tons per year. Taking 17 lb. of ferromanganese to the ton of steel as the average consumption, then 341,518 tons of this alloy would be necessary to produce the 45,000,000 tons of steel. But large quantities of spiegeleisen are used to make high-carbon Bessemer steel. If two-fifths of the Bessemer steel output of the country is high carbon steel and if 73 per cent of the total steel output is non-Bessemer steel requiring ferromanganese, then

the amount of ferromanganese necessary, or the present rate of consumption, would be, taking 17 lb. of the alloy per ton of steel:

45,000,000 × 0.73 = 32,850,000 gross tons
45,000,000 — 32,850,000 = 12,150,000 gross tons
12,150,000 × 2/5 = 4,860,000 gross tons
12,150,000 — 4,860,000 = 7,290,000 gross tons
32,850,000 + 7,290,000 = 40,140,000 gross tons
40,140,000 × 17 = 682,380,000 lb. or 304,634 tons

To supply this apparent necessary consumption in 1916 we have 270,605 tons as the apparent supply based on present output and imports. This makes, therefore, an apparent deficit of about 34,000 tons. This compares with an apparent deficit of nearly 27,000 tons for the year based on data to May 1, 1916.

In analyzing the entire situation, account must be taken of the fact that not only have unusual economies in conserving supplies of ferromanganese been practised, but spiegeleisen as well as some ferrosilicon have been important and extensive substitutes for the regular alloy. The extent of the use of spiegeleisen is indicated by the large increase in its production to Oct. 1, 1916, an increase of 46 per cent over that for all of 1915. The conclusion is reasonable, therefore, that the apparent ferromanganese deficit of 34,000 tons for the year has been fully met by the economies and substitutes referred to. This statement is further strengthened by the fact that the price has fallen from $200 to $250 per ton in June, 1916, to $160 to $165 per ton now.

Preceding analysis of the ferromanganese situation appeared in THE IRON AGE, March 4 and Aug. 5, 1915, and Jan. 27 and June 15, 1916.

Seasoning Cracks and Self-Annealing of Brass

Seasoning cracking and self-annealing of brass is a problem that should receive the serious attention of metallurgists. Such is a statement made by W. Arthur, Frankford Arsenal, Philadelphia, in a paper read by him at the meeting of the American Institute of Metals at Cleveland, Sept. 15, 1916. He cited the loss of spring temper of hard-drawn brass wire held in storage for any considerable length of time, and the tendency to discard the use of brass springs on account of this feature. Another instance cited was the failure, due to seasoning cracking, of brass cartridge shells. Heads have been known to crack entirely from the body, without having been subjected to any shock or sudden temperature change.

While no satisfactory explanation has yet been advanced to explain these phenomena, the most probable one, according to the author, is that when the crystals are broken and distorted, resulting in the production of amorphous metal, a slight increase in volume occurs. When the metal attempts to crystallize or regain its normal condition, the decrease in volume produces a condition of strain, which, unless relieved some other way, produces a break in the metal.

Steel-Bar Exports Continue to Mount

Our exports of steel bars have continued to mount until in July and August this year they were 78,947 and 79,338 gross tons respectively. Taking the average of these as a basis, the movement is at the rate of 949,704 tons per year. They have increased continually since January, when they were 58,401 tons. The following table of Government data illustrates the situation and gives the exports in gross tons:

Period	Total	Tons Per Month
Fiscal year ended June 30, 1916	625,585	52,132
Fiscal year ended June 30, 1915	230,274	19,189
Fiscal year ended June 30, 1914	149,113	12,426
Calendar year, 1915	426,002	35,500
Calendar year, 1914	123,008	10,251
Calendar year, 1913	211,716	17,643
To Sept. 1, 1916 (8 months)	524,591	65,574

The present export rate of 65,574 tons per month, or 786,888 tons per year, is nearly 13,000 tons per month in excess of that for the fiscal year of 1916 and nearly four times that of the previous pre-war record of 17,643 tons per month in 1913.

MANGANESE BRONZE FAILURE

An Explanation of the Unsatisfactory Material on the Catskill Aqueduct

An elaborated discussion of the failure of manganese bronze as an engineering material was published in THE IRON AGE, Dec. 2, 1915, being an abstract of a paper by A. D. Flinn before the American Institute of Metals. The information given therein has been supplemented by a paper by Paul D. Merica and C. P. Karr, of the Bureau of Standards, presented to the same organization at its Cleveland meeting, Sept. 14, 1916, which is condensed below.

It is stated that the failures described in the earlier paper occurred in valve castings and that "in most cases, indeed in nearly all, these cracks appeared to be close to or in a repair made by the method of burning in . . ."

The castings referred to are quite large, up to 22,000 lb. in weight, so that neither preheating of the casting for the welding or burning-in of defective areas, nor subsequent annealing of the whole casting could be conveniently carried out. As a result of the local heating of welding and consequent unequal contraction of different constrained parts of the casting, stresses remained in the casting, particularly severe near and within the burned-in areas; these stresses were in all probability responsible for the subsequent failure at these points.

A series of experiments was carried on to determine the value of such stresses in correlation with the physical properties and structures of manganese bronze as welded or burned in. The material used was from a scrapped casting of the following composition:

Copper	58.5 per cent
Zinc	39.1 per cent
Tin	1.0 per cent
Iron	1.4 per cent
Lead	Trace
Manganese	None

Bars from which a central portion was removed by sawing were used in the tests, the sawed out piece being replaced by burning-in. The conditions of the experiments simulated as closely as possible those existing in burning-in repairs in large castings. The results were uniformly sound welds. A calculation of the stresses introduced in the burned-in portion shows that at some temperatures they are greater than the elastic limit of the material, and the material yields. No bending or distortion tending to relieve these stresses was possible in the casting on which the experiments were made, and this should be borne in mind in applying the results to castings where such distortion is possible.

The conclusions to be drawn from the experiments are:

(1) That the welding-in of constrained portions of castings, forgings and wrought articles of manganese bronze produces, in general, local initial tensional stresses within and near the burned-in zone, of value equal to the true elastic limit of the material, unless the shape of the casting is such that extensive distortion may occur.

(2) That such castings should, therefore, be either preheated carefully for welding, so that all parts of the casting cool down together from a dull red heat, or, the casting should be subsequently annealed. Experience indicates that a low temperature anneal is sufficient for this purpose, e.g., from 760 to 945 deg. Fahr. for from one to two hours. Either of these precautions should eliminate these local stresses resulting otherwise from the burning-in and should produce castings free from danger of subsequent cracking.

On Saturday, Sept. 30, 2700 employees of the New Departure Manufacturing Company, Bristol, Conn., stopped the manufacture of New Departure ball bearings for the day and enjoyed a barbecued dinner of grilled lamb and accompaniments, said to be the biggest thing of the kind ever held in New England. The company furnished everything for the day and the men were enthusiastic in their commendation of the completeness with which President DeWitt Page authorized the features of the big holiday.

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Manganese and Tungsten Resources

The steel trade undoubtedly derives a considerable degree of satisfaction in knowing that our apparent supply of manganese-iron alloys continues adequate. An analysis of the situation on another page of this issue of THE IRON AGE shows that our present rate of production insures an output of nearly 196,000 gross tons of ferromanganese and over 181,000 tons of spiegeleisen for 1916, both nearly double that of two years ago and much in excess of that of the best pre-war record. This output, together with the present sub-normal imports of British ferromanganese, makes the apparent supply adequate—an unexpected achievement two years ago.

A striking feature of the situation is that the manganese ore necessary to produce this large ferromanganese output is coming almost entirely from Brazil. To produce the 146,702 tons of alloy made to Oct. 1, 1916, not less than 366,750 tons of manganese ore was necessary. Our ore imports to Sept. 1, 1916, were over 306,000 tons. These imports to Jan. 1, 1917, will amount to 501,000 tons if maintained at the present rate, and from this over 183,600 tons of ferromanganese will have been possible. This, with the imports from Great Britain, will meet the tremendous demand of our steel industry.

Some insecurity, however, lurks behind the apparent glamor of these facts. To supply this most necessary of elements in making steel, our own territory has furnished scarcely any manganese ore. Our steel industry is dependent almost absolutely upon foreign sources for manganese, without which thus far good steel is impossible. Were war to break out between the United States and a first-class foreign power, capable of controlling entirely or in part the high seas by submarine or other warfare, the situation would be a precarious one, for no nation can defend itself without steel. Assiduous efforts to discover good deposits of manganese ore in this country have been unavailing.

The tungsten situation presents a decided contrast. When the war broke out, the steel industry was confronted with a possible famine in manganese and tungsten. Since plain or alloy steels are impossible without manganese, so tungsten is essential to high speed steel. Steel for ammunition and ships and steel to machine it are absolutely essential fighting factors. Before the war Great Britain controlled the tungsten ores and Germany the manufacture of tungsten alloys. To-day, spurred by high prices, the United States leads the world in the production from its own territory of tungsten ores and alloys. We are still dangerously dependent as to manganese. It is to be hoped that either metallurgical science will discover a substitute or that the electric furnace, in the event of a scarcity, be available as the chief melting and refining medium for steel because its consumption of manganese is one-third or less than that of any other process to attain the same result.

Remarkable Tin-Plate Season Opening

What has hitherto been an annual event seems destined to be a semiannual event in future. The tin-plate mills have announced prices for next year's deliveries, but state that they will in future sell for only a half year instead of a year. The new price is $6, Pittsburgh, per base box, for contracts made with manufacturing consumers for the first six months of 1917, comparing with $3.60 announced Nov. 11, 1915, as the price for the present year. The change in the period has been discussed for years, and it is not surprising that the mills should actually undertake to make the change at this time, considering what may be regarded as the disastrous experience of the present year. When the $3.60 tin-plate price was announced sheet bars were selling in the open market at $26.50, Pittsburgh, per gross ton, whereas to-day it would be difficult if not impossible to buy them for next year at double the price. Wage rates have advanced sharply, and the wage cost of production has increased still more by labor becoming less efficient. When the mills sold tin plate for the year 1916 they were unable to cover fully on all their raw materials, and were unable to cover on any part of their labor.

In the tin-plate as in many other branches of the finished steel trade, contracts have been drawn quite loosely in the past, the mill usually obligating itself for a total tonnage greater than it could produce, as contracts are not usually specified in full. This year the contracts are being specified in full, and have been already in most instances, whereby the tin-plate mills will carry over into the new year about two months' production, chiefly at low prices. In the circumstances it is quite natural that the mills should now be endeavoring to confine their obligations to actual sales of material that will be

taken out when it is possible to produce and ship it.

The tin-plate price of $6 is a high one according to the conventional method of comparing the price with the market prices of steel and pig tin, for a continuation of the average margin that has obtained in the past few years, with a liberal allowance for increased costs of labor and other materials, apart from steel and tin, would not indicate a price much above $6, but the usual relations are lost in the tin-plate market as has been the case already in some other steel products.

The tin-plate mills look upon the question purely as one of supply and demand, that tin plate for next year is simply a question of deliveries. The conviction is expressed that it will be physically impossible to produce enough tin plate in the first half of next year to supply the domestic demand plus that portion of the export demand the mills have lately been supplying.

The possible tin-plate production is much larger than might be supposed. The mills will be able to make much more tin plate than they have ever made in the past. In the first place, there are more mills, as several of the independents have largely increased their capacity in the past few months. In the second place, the tin-plate works will be able, on an average, to produce much more tin plate per mill than they have hitherto produced, because they intend, on account of the heavy demand for tin plate, to give up the making of black plate specialties.

The new year will open with a total of some 440 mills, about 45 per cent being controlled by the leading interest and about 55 per cent by independents. Working under the same conditions as obtained in 1915, the mills, operating full for 50 weeks of the year, would be able to produce more than 1,400,000 gross tons of tin and terne plate. In 1915, however, almost 20 per cent of the total "tin-mill" product was in the form of tin-mill specialties, produced chiefly at the regular tin-plate works, as there are relatively few tin mills in the regular sheet plants. Assuming, however, that the amount of tin-mill specialty business to be given up by the regular tin-plate works is only one-half the proportion obtaining in 1915, it would be possible to produce in 1917 about 1,600,000 gross tons of tin plate. Last year's production was 1,055,936 tons, passing the record of 962,971 tons made in 1912. Only a rough guess can be hazarded at the current year's production—perhaps 1,200,000 tons. An increase of 50 per cent in tin-plate production in two years would certainly be astonishing, but the present attitude of the mills as to prices and form of contract cannot be harmonized with any other expectation.

The first United States tin-plate production officially reported was for 1891, the grand total then being 999 tons. Assuming no production in 1890, production rose above 100,000 tons in 1895, above 500,000 tons in 1906 and above 1,000,000 tons in 1915, while there are certain indications that production may be above 1,500,000 tons in 1917. The original protective duty, which established the industry, was the McKinley duty of 2.2 cents per pound, effective July 1, 1891, the McKinley bill having passed in October, 1890. The present duty is an ad valorem one, 15 per cent. At prices obtaining in the Welsh market when the present tariff was enacted, this would be equal to a specific duty of about 0.44 cent per pound. At prices now quoted abroad it would equal a duty of about 1.18 cents per pound. The situation in Europe thus supplies the place, for the present, of tariff protection. American mills are quoting higher prices on export than on domestic business, yet those prices are much lower than are quoted abroad. If a time came when tariff protection were really needed the present ad valorem rate would have to be raised considerably.

Our Inefficient Tariff

A very disturbing factor in the national revenue situation is the rapid increase in importations without a corresponding increase in customs collections. Ever since the Underwood-Simmons tariff act was placed on the statute books in October, 1913, there has been a steady downward movement in the average ad valorem rate of duties collected until at the present time importations are paying barely 8 per cent, as against 19.4 per cent for the entire period of the Payne-Aldrich law and 25.9 per cent for the Dingley law. Under this relatively low ad valorem it is not surprising that the customs collections should be far below normal, notwithstanding the fact that importations are showing impressive totals. For the month of August of the current year the total imports amounted to approximately $200,000,000, as against $142,000,000 for the same month of 1915, an increase of 40 per cent. That this is not merely sporadic is clearly shown by an examination of the figures for the eight months ended August, 1916, during which the total importations aggregated $1,666,155,000, as against $1,150,858,000 for the same period of 1915, a gain of 45 per cent.

The significance of these figures is emphasized by the fact that only once in the history of the Government have the imports of the eight months exceeded the figures for 1915, those for 1913 having aggregated about five and a half million dollars more. It will therefore be seen that the imports for the past eight months have exceeded the previous high water-mark by nearly 45 per cent. The gains as compared with last year are distributed throughout nearly all the great groups into which current imports are divided. Crude materials for use in manufacturing have risen from $53,464,000 to $82,888,000; food stuffs in crude condition and food animals, from $18,192,000 to $18,954,000; food stuffs partly or wholly manufactured, from $21,729,000 to $25,946,000; manufactures for further use in manufacturing, from $23,069,000 to $37,628,000.

Perhaps the most significant feature of these statistics is the striking manner in which they refute the claims of the framers of the Underwood-Simmons bill that it would stimulate the importation of food stuffs rather than partially or wholly completed manufactures. The gain in the two classes of food stuffs is seen to be but $4,779,000, while that in manufactured goods is $22,683,000. If these conditions can prevail when the leading manufacturing countries of Europe are at war, and therefore are concentrating their energies upon the production of war material, what will happen when their manufacturing facilities are released for the

production of standard goods for general consumption?

In this connection the statistics for August and for the eight months ended August embrace some exceedingly interesting figures, showing the extent to which all the belligerent countries, save Germany alone, are increasing their respective shares in our import trade. During August of this year we received from France merchandise to the value of $10,061,000, as compared with $7,538,000 for the same month of 1915, while for the eight months of 1916 the total was $75,832,000, as against $46,994,000 for the same period a year ago. Our receipts from the United Kingdom during August of this year aggregated $24,596,000 as against $18,535,000 for the same month of 1915, while for the eight months of this year the total was $219,115,000, as against $161,737,000 last year. Even Russia participates in this exhibit, and while her share is not large it is increasing more rapidly than that of any of the other allies, having risen in August from $440,000 in 1915 to $1,703,000 in 1916. Russia's share for the eight months of 1915 was only $912,000, but for the same period of 1916 it is $3,558,000, an increase of nearly 300 per cent. For the month of August, Italy shows a gain from $2,694,000 to $3,908,000, and for the eight months an increase from $34,496,000 to $42,632,000. Even little Belgium is steadily increasing her share in our imports, the record showing a gain from $76,368 in August, 1915, to $90,768 for the same month of 1916.

The argument that the reduction in duties has been a benefit to anyone falls flat when there is the practical experience that the cost of living has increased. The sum and substance of the whole matter is that a large volume of imports is going to waste so far as the production of revenue is concerned, and it cannot be seen that anyone is benefited.

Government Needs Get Preference

Navy Department officials, according to Washington advices, are paying high tribute to the patriotism of American shipbuilders and of manufacturers of materials entering into the construction of war vessels.

Confident predictions are made that there will be plenty of genuine competition for the contracts covering the 1917 building program to be let upon the basis of bids to be opened Oct. 25 on 59 vessels and Dec. 6 on 4 battle cruisers. The confidence of the Department is based not only upon the large number of applications for plans and specifications but also upon written and verbal assurances that have come from some of the leading men in the shipping industry, in the steel trade, and in other lines of manufacture tributary to shipbuilding. It has been made perfectly clear to the Department that the shipyards are not looking for business, but on the contrary that their facilities are mortgaged for a long time to come. Shipbuilders, however, have given very positive assurances that they will not only accord the naval work a distinct preference, as compared with all merchant work not already contracted for with specified deliveries, but that wherever possible existing facilities will be expanded liberally, irrespective of any business that may follow the contracts now offered by the Department. This public-spirited attitude on the part of the shipbuilders is the more notable in view of the unjust criticism to which they have been subjected by the Secretary of the Navy because of their failure to meet his views concerning the cost of constructing the dreadnaughts authorized a year ago.

British Labor Wants National Control of Resources and Large Industries

The national control of land, the national ownership of food warehouses, of war munition manufacture, of mines and railroads and a first claim for the State on the use of shipping was urged in a resolution which passed unanimously in a trade union congress held in Birmingham, England, Sept. 4. The congress was attended by 663 delegates representing 2,850,547 wage earners. The president in his annual address emphasized that the unions want the State to take over the mines, railroad and shipping and to control the great storage warehouses and granaries. He also said that they demanded the creation of a Ministry of Labor and this was also incorporated in the resolution. He admitted that the problems to be solved on the declaration of peace are serious. The Government, he said, should take necessary steps in advance, in the national organization of industry, to provide that extensive public works of all kinds be undertaken to prevent widespread or lasting unemployment. He believed that employers should agree to put their business on a new footing by admitting workmen to some participation, not in profits but in control.

It was reported that there had been correspondence with the American Federation of Labor, the latter recommending the holding of an international trade union congress at the same time and place as the meeting of the plenipotentiaries arranging terms of peace. The recommendation was rejected by a majority of two to one, it being deemed impossible to have any dealings with delegates of the enemy nations. A resolution in favor of the adoption of an 8-hr. day was passed with a view to facilitating the problem of unemployment.

Our Huge Crude Steel Exports

Attention was called last week to the striking volume of our crude steel exports. It was shown that, based on the average monthly rate for this year to Aug. 1, 1916, the present outgo was at the rate of a little over 1,000,000 gross tons per year. Since this estimate was made the official figures for August have been published, which show that for that month the exports of steel ingots, billets and blooms were 160,921 tons, the largest monthly exports since the war started and ever recorded. Revising the estimates and taking the monthly exports for May, June, July and August (142,782, 116,425, 135,827 and 160,921 tons respectively), the average for which is 138,989 tons, the present export rate for 1916 on this basis is 1,667,868 tons. This one product exceeds the total steel exports of 1,549,543 gross tons for the year 1914 and of 1,540,895 tons for 1910.

The North Cornwall furnace of the Lackawanna Iron & Steel Company, at Lebanon, Pa., will be lighted some time this month, according to a statement in a local paper attributed to Lloyd Wolfe, local manager. The stack, which has been out of blast for years, has been rebuilt at a cost of about $100,000. A new engine, new stock house and new tracks have been added.

The Thew Automatic Shovel Company, Lorain, Ohio, has increased its capital stock from $750,000 to $1,000,000, the increase to be distributed as a stock dividend.

The Standard Steel Car Company, Pittsburgh, has appropriated $300,000 to be spent in new buildings and additions to its plants at New Castle, Pa.

Lake Superior Corporation's Meeting

That the financial affairs of the Lake Superior Corporation are in such a condition as to make a reorganization desirable, including among other things a reduction in the capital stock, was imparted by J. Frater Taylor, vice-president, at the annual meeting held in Camden, N. J., Oct. 4. No statement was given out that might throw light on the actual financial condition of the corporation, so far as its present earnings are concerned, but Mr. Taylor said: "You will have noted the large sum of $47,974,556, which still appears unsecured in the balance sheet. We must deal with this drastically."

After referring to the weak points dragging the corporation back, Mr. Taylor outlined the success obtained in reducing the fiscal obligations in the last year. Among these he cited the payment of $1,200,000 borrowed from banks, leaving the sheet clean in this respect. Seven years ago, he said, the first mortgage bonded indebtedness was more than $10,000,000, an obligation which now is scarcely more than one-half that sum. Money would be needed to improve the Algoma Eastern Railway and to develop the Algoma Steel Corporation to handle a varied line of products, as it would not be on a substantial basis until it was able to make something else besides steel rails.

A number of the income bondholders desired an explanation of the reason for not paying interest on this class of security, saying it had been earned. The company's policy, said Mr. Taylor, was to conserve every bit of the earnings toward paying off $2,500,000 of notes due next March. By wiping out this debt a saving of $150,000 annually would be effected.

The directors re-elected were Herbert Coppell, New York; Joseph S. Dale, New York; W. C. Franz, Sault Ste. Marie, Ont.; Thomas Gibson and Alexander Taylor, Toronto; Walter K. Wigham, London; Harvey I. Underhill, South Orange, N. J., and the following from Sault Ste. Marie: A. H. Chitty, J. F. Taylor and James Hawson.

The directors elected the following officers: J. Frater Taylor, president; Herbert Coppell, W. C. Franz and James Hawson, vice-presidents; Alexander Taylor, secretary; James Hawson, treasurer, and Walter K. Wigham, chairman of the board.

Steel-Plate Exports Assuming Large Proportions

Steel-plate exports have recently shown a large increase over both recent records in excess of the record exports in 1913. As judged by those to Sept. 1, 1916, they are at the rate of 238,168 gross tons per year. The exports since January have varied between 18,612 tons in March and 26,297 tons in August, with the average for the eight months at 21,514 tons. The following table of Government data gives the exports for various periods, in gross tons:

Period	Total	Tons Per Month
Fiscal year ended June 30, 1916	266,815	22,234
Fiscal year ended June 30, 1915	123,914	10,326
Fiscal year ended June 30, 1914	160,389	13,365
Calendar year, 1915	222,472	18,539
Calendar year, 1914	111,642	9,303
Calendar year, 1913	223,814	18,651
To Sept. 1, 1916 (8 months)	172,117	21,514

The present monthly rate, at 21,514 tons per month, considerably exceeds the previous pre-war record of 18,651 tons per month in 1913. The destination of these exports has also been unusually diversified.

Allison & Co. Buy Economy Boiler Works

Allison & Co., Chester, Pa., announce that they have purchased the plant of the Economy Boiler Works at Fifth and Lincoln streets, Chester, and that they intend to have a well equipped machine shop operating there by Oct. 15. Plans have been drawn for a new forge shop, 40 x 60 ft., and a new machine shop, 60 x 75 ft., which will be used for the manufacture and finishing of special forgings, such as crankshafts, etc. The inauguration of this work will probably not be started before the spring of 1917. W. G. Seeley has been appointed sales manager, having severed his connection with E. I. du Pont de Nemours & Co.

New Machinery Corporation Organized

The Inter-Continental Machinery Corporation has been incorporated at Wilmington, Del., with a capital stock of $500,000. Its head offices are in the City Investing Building, 165 Broadway, New York, and it will deal in machinery in general, but specialize in machine tools both in the United States and foreign countries. The company has already several exclusive agency arrangements, as well as contracts to purchase material for foreign commissions, the work on which is under way.

The company will establish branch offices in the principal countries of Europe, beginning with Russia. As the principal manufacturers in Russia are in and around Petrograd, the company will establish its branch in that city, following with Moscow, Odessa and Vladivostok for the sale of American machine tools. Offices and salesrooms at Paris, Milan and London will follow.

It is also planned to open offices in China and Japan. In China a different procedure is required than that in the European territories. The need there is for complete plants. The company will accordingly make arrangements whereby its engineers will be able to sell to Chinese customers all necessary products without its clients going to various manufacturers for their needs. In other words, it will specialize in equipping complete plants in China, furnishing engineering services where necessary.

The organization is headed by Charles N. Thorn, who has had 25 years' experience in the machine-tool industry, having been for 14 years connected with Manning, Maxwell & Moore, Inc., and until recently was vice-president of the Allied Machinery Company of America, which is now part of the American International Corporation. For the latter, Mr. Thorn spent five years in Europe developing continental business. The other officers consist of Joseph S. Clark, of E. W. Clark & Co., Philadelphia, vice-president; R. E. Robinson of R. E. Robinson & Co., bankers, 30 Broad Street, New York, vice-president; Chester B. Overbaugh, formerly manager of the Thompson-Starrett Company, Washington, D. C., vice-president, and the secretary is Arthur M. Watkins, who is also sales manager for the United States. Mr. Watkins is a practical engineer and is fitted for estimating on necessary mechanical equipment. He has spent many years in various large shops and for the last 17 years in marketing machines for one of the largest machine-tool companies in the world. The directors are Frank J. Humphrey of the Kissel-Kinnicutt Company, bankers, 14 Wall Street, New York; George W. Hendrick, 3d, of E. W. Clark & Co., and the president and vice-presidents of the company. The company has been financed and no securities will be offered to the public.

Decrease in Steel Corporation's Orders

The United States Steel Corporation's statement for September showed a decrease of 137,733 net tons in unfilled orders on its books at the close of business Sept. 30, 1916. The total orders were 9,522,584 tons against 9,660,357 tons on Aug. 31, 1916. The showing a year ago was 5,317,618 tons, but only 2,787,667 tons on Sept. 30, 1914. The following table shows the unfilled tonnage for each month from January, 1913.

	1916	1915	1914	1913
January	7,922,767	4,248,571	4,613,680	7,827,368
February	8,568,966	4,345,371	5,026,440	7,656,714
March	9,331,001	4,255,749	4,653,825	7,468,956
April	9,829,551	4,162,244	4,277,068	6,978,762
May	9,937,798	4,264,598	3,998,160	6,324,322
June	9,640,458	4,678,196	4,032,857	5,807,317
July	9,593,592	4,928,540	4,158,589	5,390,356
August	9,660,357	4,908,445	4,213,331	5,222,468
September	9,522,584	5,317,618	2,787,667	5,003,785
October	.....	6,165,452	3,461,097	4,513,767
November	.....	7,189,489	3,324,592	4,396,347
December	.....	7,806,220	3,836,643	4,282,108

The A. P. McCulloch Machine Company has removed its machine shop from Chelsea, Mass., to 216 High Street, Boston, where it will have larger quarters and increased facilities for getting out work promptly, and will continue to manufacture tools and special machinery.

CHANGES IN MIDVALE

Vice-President Barba Resigns and Is Succeeded by E. E. Slick

William P. Barba resigned as vice-president of the Midvale Steel Company on Oct. 6 and E. E. Slick, vice-president and general manager of the Cambria Steel Company, at Johnstown, Pa., has been appointed to succeed him. Mr. Slick is to have complete charge of operations at the works of the Midvale Steel Company, Cambria Steel Company, Worth Brothers Company and Wilmington Steel Company. He will be located in the

E. E. SLICK

general offices of these companies in the Widener Building, Philadelphia.

Mr. Barba retires after 36 years' connection with the Midvale plant at Nicetown, Philadelphia, and it is understood that he has resigned from the board of directors of the Midvale Steel & Ordnance Company. He served in succession as chemist and metallurgist, department superintendent, general manager of sales, general superintendent, general manager and finally, after the purchase by the Midvale Steel & Ordnance Company, as one of the vice-presidents.

It was late in 1912 that Mr. Slick resigned his position as chief mechanical engineer of the Carnegie Steel Company to assume the newly created position of general manager of the Cambria Steel Company. His first position was with the Cambria Iron Company, but he left the drafting room there in 1890 to go to the Edgar Thomson steel works, where he afterward became chief engineer. At the formation of the United States Steel Corporation he was made the chief engineer of the Carnegie Steel Company. He was associated on the committee of engineers advising on the building of the Gary and Duluth plants of the Steel Corporation.

The Philadelphia Bourse has received a communication from the Chamber of Commerce, Paris, which says in part: "The large factories in the suburbs of Paris, in the neighborhood of Lyons, St. Etienne, Rouen and Annonay, built for the preparation of acids, powder and explosives, will be, after the war, converted into works for the manufacture of perfumes, chemicals used in photography and pharmacy and dyeing materials, both organic and inorganic."

Railroad Equipment Business

The buying of railroad equipment is increasing in volume notwithstanding the oversold condition of steel mills. Export contracts for about 50,000 tons of rails running from 60 to 100 lb. to the yard are understood to have been placed by New York agents with several different mills for shipment to France and Italy over the second half of 1917; the understanding is that probably none of the shipments will be made before the last quarter. Inquiries are still in the market for 100,000 to 150,000 tons including 50,000 tons for France, 50,000 tons for Belgium and from 25,000 to 50,000 tons for Denmark. Several other recent sales of small lots of standard sections have been made for export at prices ranging from $50 to $60 per ton at the mill.

There are numerous small inquiries from domestic roads for as early shipment as the mills can promise, but few contracts are being placed because rail manufacturers will not promise shipments before the last quarter of 1917 or the first quarter of 1918.

Railroads and locomotive shops are also actively in the market for boiler tubes for shipment during the last quarter of 1916 and the first quarter of 1917. One $40,000 order has just been placed for this year's shipment. A heavy demand is being experienced for track work, especially for frogs and switches, to be used in new terminals and sidings. Two large Eastern trunk lines have bought double the amount they would purchase in ordinary times.

Car shops report inquiries for about 15,000 freight and passenger cars, but only two-thirds of the business pending is expected to be closed in the near future. The Western Maryland has awarded a contract for 2000 steel hopper cars to the Pullman Company. The Wheeling & Lake Erie is understood to have divided a contract for 1000 cars equally between the Standard Steel Car Company and the Pressed Steel Car Company. The latter shops have also received an order for 10 tank cars from Island Petroleum Company. The Chicago & Northwestern is in the market for 3200 cars, including 1700 gondolas, 1000 wooden box cars and 500 steel ore cars.

British Ferromanganese Market

The ferromanganese market report of the London *Iron and Coal Trades Review*, in its issue of Sept. 22, 1916, has the following to say:

> The advance in the price of Indian manganese ore only two weeks ago naturally adds to the cost of production here. Supplies of ore, however, are on a much larger scale than they were at this time last year, the imports in August, for example, having been 46,700 tons against 10,600 tons in August, 1915. But the consumption, of course, is continually increasing. The market for ferromanganese, however, remains quiet and generally firm. The export demand does not improve, and it is believed that the current price may be shaded for delivery over next year, although no business on this basis is reported and no change of any importance is expected.

At Seattle, Wash., Sept. 28, the Manufacturers' Association gave a banquet in honor of the men who have been instrumental in developing in the Pacific Northwest the new era of shipbuilding. Two hundred and fifty shipbuilders, lumbermen, merchants and brokers from Vancouver, B. C., to Portland, Ore., were in attendance to celebrate "Shipbuilders' Night." Statistics presented showed that more than $30,000,000 worth of merchant ships are now under contract in that region. Among the speakers at the banquet were Will H. Parry, member of the Federal Trade Commission; Dr. Henry Suzzallo, president University of Washington; William Piggott, president Manufacturers' Association, and D. E. Skinner, Skinner & Eddy Shipbuilding Corporation, at whose Seattle yards a steel merchant ship was launched on the same day.

The Torsion Balance Company, 147 Eighth Street, Jersey City, N. J., maker of balances, scales, testing and precision instruments, has purchased the warehouse of the United States Express Company as an addition to its machine shop and manufacturing space, and will handle brass and instrument work.

BRITISH STEEL EXPORTS

August Shipments Next to the Highest for the Year—Imports Lower

Great Britain's export of iron and steel for August, composed mostly of supplies sent to the Allies, were 319,928 gross tons, excluding iron ore and including scrap. Despite considerable effort to restrict exports those for August rank second for the year 1916, the largest having been 395,750 tons in May, with June third at 310,595 tons. The average monthly exports for the first eight months of this year are now 312,755 tons, which compares with the monthly average in 1915 of 270,858 tons.

Pig-iron exports for August were 43,183 tons, against 62,917 tons in July, this year, and 42,712 tons in August, 1915. To Sept. 1, 1916, total pig-iron exports were 346,849 tons, as compared with 191,757 tons to Sept. 1, 1915. France and Italy continue to take the bulk of these exports.

Ferromanganese exports in August were about 52,000 tons, against 30,000 tons in August, 1915. To Sept. 1, 1916, they were about 327,000 tons, contrasting with only 126,000 tons to Sept. 1, 1915. The present export rate is therefore about 40,000 tons per month, as compared with only about 15,000 tons per month in the same period a year ago.

Steel-bar exports in August were 59,637 tons (50,288 tons going to France), against 39,668 tons in August, 1915. The total to Sept. 1, 1916, was 466,587 tons, as compared with 307,794 tons to Sept. 1, 1915. France has taken 395,826 tons of the former total.

Rail exports in August were only 1983 tons, a decided contrast to the 32,962 tons exported in August, 1915. The total rail exports to Sept. 1, 1916, were only 33,746 tons, or only about one-sixth of the exports of 190,152 tons for the same period in 1915. The movement in galvanized sheets continues at about 50 per cent of that of last year, having been only 8238 tons in August, as compared with 19,580 tons in August, 1915. The total for the first eight months of this year was 103,454 tons and for the same months in 1915, 218,129 tons.

Exports of tin plates continue about the same, the monthly change for 1916 having been slight. In August they were 34,124 tons, against 38,174 tons in July. The total exports to Sept. 1, 1916, were 260,896 tons, against 260,435 tons to Sept. 1, 1915. France took 55,595 tons of the former total.

Imports of iron and steel in August, excluding iron ore and including scrap, were unusually low, having been 72,033 gross tons, against 83,186 tons in July, 1916, and 128,486 tons in August, 1915. The record month for 1916 was May, with 86,303 tons. The monthly average for 1915 was 107,944 tons.

Blooms, billets and slabs imported in August were 20,104 tons, comparing with 10,898 tons in July and 46,919 tons in August, 1915. The total to Sept. 1, 1916, which was 106,998 tons, was only one-third of that for the same period last year—316,776 tons. Of the former total the United States supplied 85,889 tons, against 252,330 tons last year.

Iron-ore imports in August were large, having been 741,612 tons, against 572,378 tons in August, 1915. The total to Sept. 1, 1916, was 4,879,221 tons, compared with 4,239,167 tons to Sept. 1, 1915.

The valuation of the exports for the first eight months of this year is reported to be £40,804,243 against £25,671,153 for the same eight months of 1915.

German Steel Shipments Decreasing

August shipments of the German Steel Works Union were 250,831 metric tons, which is the lowest for any month this year. The July shipments were 282,875 tons, and in August, 1915 and 1914, they were 250,080 tons and 94,984 tons respectively. The record for 1916 thus far was 311,620 tons in May. The August shipments were made up of 73,208 tons of semi-finished steel, 94,977 tons of railroad material and 82,646 tons of shapes.

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Chrome-Nickel Iron and Steel Products*

Possibilities for Their Development Presented by the Iron Ores of Mayari, Moa Bay and Other Districts in Cuba

BY DR. LEONARD WALDO

The following historical review has been inspired more particularly by the great possibilities in the way of iron and steel products of exceptional quality and value which are offered by the chrome-nickel iron ores found at Mayari, Moa Bay and other points on the north coast of Oriente Province, Cuba.

The very distinguished French chemist, Berthier, published† nearly a century ago his interesting researches into the relation of chromium to iron. He found, first, that by applying a strong heat to a mixture of the oxide of chromium and an oxide of iron contained in a charcoal lined crucible, these oxides were completely reduced and a perfectly hemogeneous combination of the two metals was obtained. A steel maker, M. Merimee, took two of the chrome-iron alloys, one containing 1 per cent of chromium and the other 1½ per cent, and, with the aid of a co-worker skilled in the making of swords and razors, made with these alloys both swords and razors which were found to be of most excellent quality, with hard and lasting cutting edges. In addition to their fine quality as a steel, the blades received a very beautiful damaskeening of a variety of veins of brilliant silver white after the blades were treated by rubbing with sulphuric acid. M. Berthier was much impressed with the quality and beauty of this steel and only regretted that the costliness of chromium would make such a steel too dear in his time. He, however, points out with the instinct of the metallurgical prophet that if such steel could be made serviceable in the arts it might be obtained cheaply, if we could substitute chrome iron ore instead of chromium in its manufacture, and he further outlines a process by which such chrome iron ore might be used.

EARLY APPLICATIONS OF NICKEL STEEL

The immortal Michael Faraday, experimenting upon meteoric iron in the Royal Institution, found that this iron consisted of an alloy which had all the excellent qualities of our modern nickel steel; and it is told of Captain Barrow, who found a meteorite in South Africa in 1820, that he had made from it a sword blade 2½ ft. long which acquired in tempering a remarkable degree of elasticity and which is now the property of the emperors of Russia. It is told of the Esquimos, whom Captain Ross encountered in his expeditions to the North Pole, that their knives were made from meteorites, and we have in these early uses the first applications of nickel steel.

Just as in the case of the East Indian steels being favorably affected by small quantities of aluminum, so in these early steels we have incipient qualities which contemporary metallurgy has developed to the highest degree with reference to the extreme hardening qualities of chromium and the toughening qualities of nickel.

In considering the three elements, we have for chromium a specific gravity of 6.50; for iron a specific gravity of 7.76, and for nickel a specific gravity of 8.57. The iron, which is the matrix for the other two, thus has a density midway between them. The melting point of the cromium is 2750 deg. Fahr.; that of iron almost the same, and that of nickel 2640 deg. Fahr. We have, therefore, in these three metals a similarity of melting points and densities which leads to great ease of diffusion when melted together—a quality which works for homogeneity of the mixture and which homogeneity is the first condition of successful billet manufacture, as well as of castings in modern steels.

FIRST WORK ON CHROMIUM STEEL

A long line of distinguished metallurgists, attracted by the great promise of nickel and chrome-steel alloys, have devoted themselves to their critical study. Vanquelin, who had discovered chromium in 1797, published in the following year his "Memoire sur le Nouveau Metal Appelé Chrome." This was followed by Faraday's "Alloys of Steel" paper in 1822 and by Berthier's paper upon the "Alloys of Chrome with Iron and with Steel" in 1823. Frémy described blast-furnace alloys of oxide of chromium and metallic iron in 1857, and in 1861 Mushet, the father of our modern high speed steels, took out an English patent for "adding to and melting with any mixture of metals which, when melted, produced cast-steel, a quantity of a mixture of pulverized pig iron, cast iron or refining iron and oxide of manganese with pulverized chrome ore or oxide of chromium commercially." In 1877 his firm had supplied the works of Sir Robert Hadfield at Sheffield with 30 per cent ferro-chromium at as low a price as two shillings per pound.

Following Mushet, Julius Baur of New York, to whom Sir Robert Hadfield gives the credit of first introducing on a practical scale the manufacture of chromium steel, took out an American patent in 1865, claiming "a steel greatly improved, toughened and hardened by the addition of chromium," and also claiming to be the first to establish the fact that chromium could be used practically in making steel. From this time on we may regard chromium steel as having been launched on its distinguished career. In 1892 there appeared in the *Journal* of the Iron and Steel Institute Hadfield's classic paper on the alloys of iron and chromium, followed by Osmond's report on the chromium steel of R. A. Hadfield, giving plates showing the penetration effected by Hadfield 13.5-in. chromium steel projectiles fired at Shoeburyness from the 63-ton. B.-L. gun, and also plates showing 9-in. compound armor plate penterated by Hadfield's chromium steel projectiles.

The action of nickel when alloyed with iron is very different from that of chromium. It can be added up to one-third of the entire weight of the iron, in which case we have the remarkable invar steel, a steel with practically no coefficient of expansion up to twice the temperature of boiling water. There seems to be no appreciable chemical union of the nickel with the iron, and its general effect is to increase the temporary toughness, to raise the elastic limit and to make a commercial steel of great value. But in the percentages ordinarily used, up to 3½ per cent say, nickel, shows no remarkable qualities as compared with the action of chromium in steel.

CHROME-NICKEL-IRON SERIES

Recent investigators, such as Moisson, Carnot and Goutal, have shown that the action of chromium is very complex, in that it forms compound carbides of chromium, carbon and iron, and that in the presence of nickel the action of the chromium as a hardening element is greatly increased. These discoveries have led to a satisfactory explanation of the peculiar excellent qualities of steels and irons in which the nickel, chromium, carbon and iron are united. The immediate result of the discovery of the fact, and a formulation of the reason, has led to the development of the chrome-

*From a report prepared for the Moa Bay Iron Company, New York.

†Annales de Chem. Tome XVII, p. 63, Paris, 1821.

nickel-iron series of alloys unexampled in the development in amount of any other series of commercial alloy steels.

At the autumn meeting of the British Iron and Steel Institute in 1913 there was a most interesting paper on the manufacture of armor-piercing projectiles, followed by a discussion most favorable to the art of the work done at the Girod plant in Ugine, France; at the Cockerill works in Belgium; at the Hadfield works in Sheffield and at other plants. Results were described in this paper of projectiles penetrating Krupp cemented plates of a thickness equal to the diameter of a projectile of 10 in., weighing 485 lb., and having an initial velocity of 1784 ft. per second. Another result was that of a 12-in. projectile piercing, without breaking, a 12-in. plate, the projectile weighing 922 lb. and having an initial velocity of 1984 ft. per second. These examples are cited because the severest mechanical test known for the combined qualities of a commercial steel is in withstanding the strain of the impact of projectiles. The manufacture of armor plates and projectiles is one in which the cost of manufacture is subordinate to the result to be obtained. Material of this high order of excellence finds a wide use in other and more peaceful applications, and the extent of such other uses is proportional to the lowering of the price of manufacture. The first volume of Carnegie Scholarship Memoirs of the Iron and Steel Institute for 1909 gives a long list of chrome-nickel steels, which in their cast state give the greatest adaptability to gears, heavy and light. The author, Revillon, cites cases where the tensile strength of such steels is considerably in excess of 200,000 lb. per square inch, and with elongations as high as 10 per cent in 2 in.

CHROME-NICKEL IRON ORES OF CUBA

The chromium-nickel alloys have been rendered commercially possible in mechanical structural engineering by the great lowering of cost, brought about by the discovery in Cuba of chrome-nickel iron ores, which, unlike other chrome-nickel iron ores, are remarkably free from sulphur and phosphorus. These Cuban ores compare very favorably with the best Dannemora ores from Upsala province in Sweden. These latter ores will contain from 0.013 to 0.08 per cent sulphur, and from 0.01 to 0.03 per cent phosphorus, whereas in certain of the Cuban ores from the Moa and Mayari districts, the sulphur and phosphorus are negligible, according to Professor Kemp's paper on the Mayari Iron Ore Deposits of Cuba, published in Vol. 51 of the Transactions of the American Institute of Mining Engineers.

In the Cuban ores the chromium is generally in excess of the nickel, oftentimes in a ratio as high as 2 to 1. It can, however, be reduced in practice from this high ratio to practically any ratio required for the particular chrome-nickel steel alloy it is desired to produce. Incidentally, the very important point is to be noted that the high cost of chromium and nickel, when produced as separate metals and then added to produce a synthetic steel, is altogether avoided.

ANALOGY OF MONEL METAL

We have an analogous metal to this in the so-called Monel metal mined in the Sudbury district in Canada. Here nickel is found in a natural alloy with copper, and the cost of the Monel metal is very much less than the cost of a copper alloy made by adding to copper the same amount of nickel as the Monel metal contains. In the case of the Monel metal, which has been longer studied and commercially used than the nickel-chrome iron natural alloys, many advantages of greater homogeneity and higher mechanical qualities have been ascribed to its being a natural instead of a synthetic product. Whatever advantages the Monel metal has shown from this cause are equally applicable to the chrome-nickel-iron Cuban product.

USES OF NATURAL CHROME-NICKEL ALLOYS

As with all iron ores the Cuban ore passes through the blast furnace and the pig metal resulting has two important markets; for use as an ingredient for steel furnace charges and, secondly, for cupola or air-furnace practice; so that the contained nickel and chromium, with the low phosphorus and sulphur, may be effective in heavy castings, such as rolls or parts of heavy and light machines subjected to a strain. Heavy rolls for rolling mill service are made containing about 0.5 per cent of chromium and 0.25 per cent of nickel, but with not more than 0.02 per cent sulphur or 0.04 per cent phosphorus, which latter elements are largely introduced by the furnace fuel used.

High service railroad rails containing 0.8 per cent of nickel and 0.25 per cent chromium, with 0.04 per cent sulphur and 0.01 per cent phosphorus, are made in large quantities.

In both these two typical cases the manufacture proceeds without greater difficulties than in ordinary roll and rail manufacturing. The low sulphur in rolls is sometimes added to in order to obtain the peculiar hardening properties of rolled surfaces, which occur with the use of sulphur, but this is immaterial to the great value of the nickel-chromium content in the roll casting itself.

The entire situation is summed up in this statement: That for the first time in the history of iron and steel, we are able to secure highly desirable mechanical qualities which obtain by the addition of chromium and nickel steel at a small fraction of the cost of such additions when chromium and nickel are added as separate metals, and that the natural additions which we have occur in an ore of such great purity as to be comparable to the finest Swedish ores which have given the deserved reputation to Swedish irons and steels.

The works production of chrome-nickel steel in the United States, according to a bulletin of the United States Bureau of Mines, was estimated to be 100,000 tons in 1913, exclusive of the natural Cuban chrome-nickel-iron product. This same bulletin expresses the opinion that "it is likely that in the near future the tonnage of Mayari steels will surpass that of all the other chrome-nickel steels taken together." This situation is already realized. The total of Cuban nickel-chrome ores reported as mined between January, 1910, and Sept. 30, 1915, is 3,279,824 tons, which is approximately 600,000 tons a year. This tonnage was largely used in rails, rolls and structural work.

As a demonstration of the excellence of nickel-chrome rails when properly made, the case is cited of the Central Railroad of New Jersey, which has had but one failure out of 6400 tons of 100 lb. per yard rails rolled for it, and put in service in 1912.

The prompt further development of these north coast Cuban ores and their immediate manufacture into standardized iron and steel ingot forms for casting, rolling and forging should be a highly desirable as well as profitable undertaking.

Blast Furnaces in France

The number of blast furnaces in France in unoccupied territory is now 48 in blast, according to *L'Usine*, Paris, with 8 ready to be blown in as soon as coke can be obtained. These furnaces are situated on the coast at Calais, Outreau, Panillac, Trignac and Le Bouceau; in central and southern France at Le Creusot, Chasse, Givors, Firminy, Alais, Montlucon, Decazeville, Furnel, Saut-du-Taru, Tarascon-sur-Ariège and Ris. The furnaces use both French and foreign ore, and their present output is only from 110,000 to 120,000 tons per month. The basin of Nancy furnishes over 50,000 tons of ore per month, while the plants on the coast get ore mostly from Bilbao, Spain. The output of the Algerian and Tunis iron-ore mines is exported to England, whence it is sent back to France as hematite pig iron. The Normandy iron-ore mines, which belonged to alien enemies of France and have been sequestered, are idle except the one at Saint-André, in Calrados, which produces about 2500 tons of ore per month. In July, 1914, just before the war, 45 plants had 116 blast furnaces in operation, producing 420,000 tons of pig iron per month, but the invasion of France considerably reduced the available output.

Iron and Steel Markets

PIG IRON STILL HIGHER

Railroad Buying Broadening

No Abatement in Export Demands—Trend to Higher Prices—Ore Situation

The movement toward higher price levels is clearer than in any of the last few weeks. In so many lines will 1916 business crowd the first quarter that 1917 necessities of some manufacturing consumers are threatened with curtailment. Much of the buying of the week has shown confidence in the duration of present conditions, and on the one hand are the bewildering volume of sales of pig iron for export and the continued deluge of requests for shipbuilding material, and on the other hand meetings of sales managers have been held to apportion as best they can what percentage of product they can give to different territories.

Railroad buying is mounting. It appears that all of 100,000 tons of rails has been closed for first quarter of 1918 shipment, presumably to insure deliveries. Among the roads may be included the Burlington, the Nickel Plate and the St. Louis & San Francisco. Over 8500 cars have been bought and the Chicago market has contracted to supply about 100,000 tons of the material.

The collective demands of the roads for structural steel for buildings and bridges exceed 10,000 tons in fresh projects and over 100 locomotives are under consideration.

After the burst of buying of pig iron in late September and early October, it is not surprising that the volume is diminishing somewhat. It has forced further price advances of 50c. and more per ton in all grades. Pittsburgh reports the sale of 30,000 to 40,000 tons of basic and Bessemer at the new prices and over 40,000 tons of foundry iron at $1 higher than last week.

The increase in ocean freight rates resulting from the activities of the German submarine at our Atlantic coast has held up shipments, estimated at 200,000 tons, mostly Southern iron. As regards the tremendous export movement, 100,000 tons are put down as last week's contribution, including 20,000 tons of standard Bessemer for Great Britain. Foundry iron has been sold to neutral European countries to the extent of 20,000 tons.

A considerable number of domestic foundries are still unprovided for, and charcoal iron is up $1 in Chicago and No. 2 foundry 75c. in the Cleveland district. Southern iron is competing in some markets and $14.50 Birmingham has not entirely disappeared. Ohio points close to blast furnaces have bought Southern iron at an advantage and for the first time in some years.

The straining to accelerate the Lake movement of ore has gone to the point of making definite plans for keeping boats in service as far into December as possible. Ore on Lake Erie docks on Oct. 1 amounted to 7,230,000 gross tons or only 755,000 tons less than a year ago, but the dock balance was increased because of car shortage. Boats are sometimes held 24 and 48 hours awaiting cars and some may be delayed for three full days on this account.

The look in the ore situation is now ahead to next year. Stock piles at blast furnaces if not at lower lake ports may in the spring remind one of laboratory samples if the present rate of mining and importing about 9¼ tons of ore to every 10 tons smelted is maintained. Estimates persist that contract vessel rates may be on the basis of $1 per ton next year. The amount of ore will, of course, depend on the boat capacity obtainable. All of the lake shipbuilding space for craft of any size has been pre-empted for 1917 and mostly for ocean-going ships. One small fleet of 12,000-ton boats is under option for sale at 2½ times their cost.

Automobile manufacturers are seeking to cover with Eastern mills for 50,000 tons of bars for the first half. Meanwhile the leading independent steel mill in the Middle West has withdrawn from the market on all its products, as its entire output of semi-finished steel for the first half has been sold, including new capacity not yet completed.

Tin plate for the first half of next year has been put at $6 per box by a number of mills and the leading interest, following its allotment of output of sheets and tin plate, will make its announcement to-morrow. Bessemer black sheets are commonly quoted at 3.25c., Pittsburgh, for the first half, although 3.15c. has not disappeared. On blue annealed sheets for the same delivery, 3.25c. is also expected.

It is estimated that no less than 50 ships are under inquiry at Atlantic shipyards. Three more ships have been put under contract at Seattle and 10,000 tons of plates for them have been bought for delivery in the first quarter of 1918. Great Britain is asking for 25,000 tons of plates besides 18,000 tons of shapes, blooms and billets. Japan has paid 5c. for relatively early shipment on 5000 tons of plates. The Victorian government, Australia, wants 4000 tons.

Pittsburgh

PITTSBURGH, PA., Oct. 10, 1916.

Considerable activity has been displayed in Bessemer and basic pig iron and a moderate degree in foundry and forge iron, and prices on all grades have moved up about 50c. per ton. Some of the independent tinplate mills have fixed their price for first half of 1917 delivery at $6 per base box, and the leading interest will announce its price on tin plate and also on all grades of sheets for first half of 1917 delivery on Thursday morning, Oct. 12. The shortage in supply of billets and sheet bars is getting more acute, and quotations as high as $60 per ton have been made. The high prices offered for coal and the shortage of labor in the coke districts have forced up prices on prompt and contract coke. Prompt has sold as high as $4.40 per net ton at oven, while there are reports of high-grade furnace coke having been sold for first half of 1917 at $3.50. Scrap is in better demand, and prices on steel-making grades are up 50c. per ton or more. The minimum mill price on bars and shapes is now 2.70c., and on plates 3.50c. at mill, the latter for delivery in second half of 1917. The railroads are buying material more freely. Some good sized car orders have been placed, and there are inquiries out from domestic

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Oct. 11, 1916.	Oct. 4, 1916.	Sept. 13, 1916.	Oct. 13, 1915.
No. 2 X, Philadelphia	**$20.00**	$19.75	$19.50	$16.25
No. 2, Valley furnace	**20.00**	19.00	18.50	14.75
No. 2, Southern, Cin'ti	17.40	17.40	17.40	14.40
No. 2, Birmingham, Ala.	14.50	14.50	14.50	11.50
No. 2, furnace, Chicago*	**19.00**	18.50	18.00	14.25
Basic, del'd, eastern Pa.	20.00	20.00	19.75	17.00
Basic, Valley furnace	**20.00**	19.50	18.00	15.00
Bessemer, Pittsburgh	**23.95**	23.45	21.95	16.95
Malleable Bess., Ch'go*	**19.50**	19.00	19.00	15.00
Gray forge, Pittsburgh	**20.45**	19.95	18.70	14.70
L. S. charcoal, Chicago	**20.75**	19.75	19.75	15.75
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh	45.00	45.00	45.00	24.50
O.-h. billets, Pittsburgh	45.00	45.00	45.00	25.00
O.-h. sheet bars, P'gh	45.00	45.00	45.00	25.50
Forging billets, base, P'gh	69.00	69.00	69.00	34.00
O.-h. billets, Phila	**50.00**	48.00	48.00	30.00
Wire rods, Pittsburgh	55.00	55.00	55.00	31.00
Finished Iron and Steel, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.47½	1.47½	1.47½	1.25
O.-h. rails, heavy, at mill	1.56½	1.56½	1.56½	1.34
Iron bars, Philadelphia	2.659	2.659	2.659	1.559
Iron bars, Pittsburgh	2.60	2.60	2.60	1.40
Iron bars, Chicago	2.35	2.35	2.35	1.35
Steel bars, Pittsburgh	2.75	2.75	2.60	1.40
Steel bars, New York	2.919	2.919	2.769	1.569
Tank plates, Pittsburgh	4.00	4.00	4.00	1.40
Tank plates, New York	4.169	4.169	4.169	1.569
Beams, etc., Pittsburgh	2.75	2.75	2.60	1.40
Beams, etc., New York	2.869	2.869	2.769	1.569
Skelp, grooved steel, P'gh	**2.50**	2.35	2.35	1.40
Skelp, sheared steel, P'gh	**2.60**	2.45	2.45	1.45
Steel hoops, Pittsburgh	3.00	3.00	3.00	1.50

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire, Per Lb. to Large Buyers:	Oct. 11, 1916. Cents.	Oct. 4, 1916. Cents.	Sept. 13, 1916. Cents.	Oct. 13, 1915. Cents.
Sheets, black No. 28, P'gh	3.10	3.10	2.90	2.00
Galv. sheets, No. 28, P'gh	4.25	4.25	4.15	3.50
Wire nails, Pittsburgh	2.60	2.60	2.60	1.75
Cut nails, Pittsburgh	2.60	2.60	2.60	1.70
Fence wire, base, P'gh	2.55	2.55	2.55	1.60
Barb wire, galv., P'gh	3.45	3.45	3.45	2.60
Old Material, Per Gross Ton:				
Iron rails, Chicago	**20.00**	19.25	18.75	13.50
Iron rails, Philadelphia	**21.00**	20.00	20.00	18.50
Carwheels, Chicago	**12.50**	11.75	11.75	12.00
Carwheels, Philadelphia	15.50	15.50	15.50	14.00
Heavy steel scrap, P'gh	**18.00**	17.50	16.00	14.00
Heavy steel scrap, Phila.	**15.50**	15.00	14.75	15.00
Heavy steel scrap, Ch'go	**16.50**	16.25	16.00	11.75
No. 1 cast, Pittsburgh	**16.00**	15.00	14.50	13.00
No. 1 cast, Philadelphia	16.00	16.00	16.00	14.00
No. 1 cast, Ch'go (net ton)	**13.25**	12.50	12.00	10.50
No. 1 RR. wrot, Phila	**22.00**	20.00	20.00	16.00
No. 1 RR. wrot, Ch'go (net)	**17.50**	16.75	16.50	11.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	**$4.25**	$3.25	$2.90	$1.85
Furnace coke, future	**3.25**	3.00	2.50	2.25
Foundry coke, prompt	**3.50**	3.25	3.25	2.25
Foundry coke, future	**4.00**	3.75	3.50	2.50
Metals, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	**28.50**	28.25	28.00	18.00
Electrolytic copper, N. Y.	28.50	28.50	28.12½	18.00
Spelter, St. Louis	9.50	9.50	9.00	13.00
Spelter, New York	**9.75**	9.70	9.25	13.25
Lead, St. Louis	6.85	6.85	6.60	4.42½
Lead, New York	7.00	7.05	6.75	4.50
Tin, New York	**42.75**	39.25	38.25	32.75
Antimony, Asiatic, N. Y.	**11.50**	10.00	11.00	28.50
Tin plate, 100-lb. box, P'gh	**$6.00**	$5.75	$5.75	$3.15

roads for close to 100 locomotives. Prices on every steel commodity are strong, and show indications of going higher. There is still a shortage of labor at nearly all manufacturing plants, and this is keeping down the output to some extent.

Pig Iron.—It is said the great increase in insurance rates on export pig iron, on account of the German submarine boat scare, has held up close to 200,000 tons of iron, mostly Southern. It is a question as to when this iron may get out of this country, if it gets out at all. It is not improbable that a part of it may be turned back to domestic consumers. There is still great activity in the local market in Bessemer and basic iron, with further advances in prices, and this has also extended to foundry iron. The Trumbull Steel Company, Warren, Ohio, has closed for 36 000 tons of basic for next year's delivery, of which 26,000 tons was sold by a Mahoning Valley furnace and 10,000 tons by another interest, the latter quantity going at $20, Valley furnace. It is understood the buyer will pile this iron, as it is not expected its new open-hearth steel plant will be ready to make steel before late next year. We also note other sales of basic amounting to 10,000 tons or more, at prices ranging from $19.50 to $20 at furnace. The Bethlehem Steel Company is inquiring for 24,000 tons of Bessemer iron for delivery to South Bethlehem, starting November, silicons running from 2.50 to 3 per cent. The Andrews Steel Company, Newport, Ky., is in the market for 6000 tons of Bessemer, and there are other inquiries. We note a sale of 10,000 tons of Bessemer for delivery in first half of next year made by a Mahoning Valley furnace to a dealer at $23 at furnace, also a sale of 3000 tons and another of 5000 tons at the same price. It is stated that a local consumer closed in the past week for 30,000 to 40,000 tons of pig iron, about equally divided between Bessemer and basic, on the basis of $23 for the Bessemer and $20 for the basic, Valley furnace. There have also been sales of No. 2 foundry iron at $20, Valley furnace, and this price now seems to be minimum of the market. We note sales of 4000 to 5000 tons of No. 2 foundry at $20, Valley furnace, for first quarter delivery, and 1000 tons of No. 3 at $19.75. A sale is reported of 1500 tons of gray forge at $19.50, Valley furnace. The whole pig-iron market is very strong, with the supply of Bessemer and basic limited, and prices on these two grades seem likely to be higher. We quote standard Bessemer iron, $23; basic, $20; No. 2 foundry, $20; malleable Bessemer, $19.75 to $20; and gray forge, $19.50, all at Valley furnace, the freight rate for delivery in the Pittsburgh and Cleveland districts being 95c. per ton. As showing the scarcity in supply, we can state that Bessemer and basic iron has recently been brought into the Pittsburgh district from furnaces at Wellston and Ironton, Ohio, and Buffalo, N. Y.

Ferroalloys.—There is a fair amount of new inquiry for ferromanganese, but no large lots have recently been closed. English 80 per cent is held quite firmly at $164, seaboard, while domestic is quoted at $165, delivered to any points of consumption east of the Mississippi. Several cargoes of ferromanganese from India have recently come into this country, and this product is being offered at a slightly less price than domestic or English, say about $2 per unit. English ferromanganese runs about 0.25 in sulphur and domestic 0.17 to 0.18, while ferromanganese from India runs from 0.60 to 0.75 in sulphur. For this reason it is offered at a lower price. No prices have yet been fixed on 50 per cent grades of ferrosilicon for next year's delivery. We quote 18 to 22 per cent spiegeleisen at $40 to $45, and 25 to 30 per cent $55 to $65 at furnace. On 50 per cent ferrosilicon we quote $88 to $89 in lots up to 100 tons; over 100 tons, $87 to $88, and over 600 tons, $86 to $87, all per gross ton, f.o.b. Pittsburgh. We quote Bessemer ferrosilicon as follows: 9 per cent, $30; 10 per cent, $31; 11 per cent, $32; 12 per cent, $33; 13 per cent, $34.50; 14 per cent, $36.50; 15 per cent, $38.50, and 16 per cent, $41. Seven per cent silvery is $28.50; 8 per cent, $29; 9 per cent, $29.50; 10 per cent, $30; 11 per cent, $31, and 12 per cent. $32. These prices are f.o.b. furnace, Jackson or New Straitsville, Ohio, or Ashland,

Ky., all having a freight rate of $2 per gross ton to Pittsburgh.

Billets and Sheet Bars.—The demand for billets and sheet bars, both export and domestic, continues enormously heavy, and the shortage in supply seems to be getting more acute. Consumers who have been trying to buy steel rounds to be made into shells for shrapnel are not able to get them and are now buying small ingots from steel-casting plants and turning them on lathes into steel rounds. One export inquiry is in the market for about 4000 tons of cast ingots, 6¼ in. thick by 16½ in. long, to be made into 6-in. rounds. It is said that quotations as high as $55 and $60 per ton have been made on ordinary soft Bessemer billets and sheet bars, but we do not hear of any steel being sold as yet at these prices. The absolute minimum on soft Bessemer and open-hearth steel billets and sheet bars is $45 at mill on contracts, and up to $50 and higher to consumers who are short of steel and trying to buy in the open market. A sale of 1500 tons of open-hearth sheet bars is reported to have been made at $48 per ton, maker's mill. We quote soft Bessemer and open-hearth steel billets and sheet bars at $45 to $50 at mill, Youngstown or Pittsburgh. We quote forging billets at $69 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take $1 extra.

Steel Rails.—It is said that contracts for considerable quantities of standard section rails have been placed lately by several railroads, deliveries running into 1918. Some orders have also been placed for standard sections for delivery in third and last quarters of 1917, and the rail mills seem assured of full work through all of next year. The new demand for light rails is active from the coal-mining interests, and several of the rerolling rail mills have recently made fairly large sales of rerolled rails for export. We quote 25 to 45 lb. sections at $47; 16 and 20 lb., $48; 12 and 14 lb., $49, and 8 and 10 lb., $50, in carload lots, f.o.b. at mill, the usual extras being charged for less than carload lots. We quote standard section rails of Bessemer stock at $33 and of open-hearth $35, per gross ton, Pittsburgh.

Plates.—The situation in plates is getting more tense, and the market as regards supply is in a state of famine. The demands of the shipbuilding companies for plates are still enormously heavy. One leading mill has sold several large lots of sheared plates for delivery in the second half of 1917 at 3.50c. at mill, and could have sold more if it cared to do so. Orders for steel cars are coming out freely, and this is helping to make the shortage in supply of plates more keenly felt. The export demand is heavy. It is said that foreign inquiries call for over 100,000 tons. The Carolina, Clinchfield & Ohio Railroad has placed 400 steel hoppers and 100 steel gondolas with the Pressed Steel Car Company. The Western Maryland is reported to have placed its order for 2000 steel hopper cars with the Pullman Company. The New York Central has placed 2000 gondolas and 1000 box cars with the American Car & Foundry Company and 2000 gondolas with the Standard Steel Car Company, in addition to the 5000 cars it previously ordered. The Père Marquette has bought 100 steel underframes from the Pressed Steel Car Company. Active inquiries in the market include 500 to 1000 tank cars for the Union Tank Line, 500 50-ton steel ore cars for the Chicago & Northwestern and 1000 50-ton hopper cars for the Chesapeake & Ohio. We quote ¼-in. and heavier plates at 3.50c. at mill for delivery in second half of 1917, while for delivery in two to four months fairly large lots are quoted at 4c. up to 5c. at mill. Small lots for reasonably early shipment are reported to have sold above 5c. at mill. The demand for universal mill plates is not so active, and these can be had for delivery in two to three months at 3.50c., or slightly less, at mill.

Structural Material.—The new demand is active and a good many jobs are being placed. The Riter-Conley Company has taken close to 5000 tons for new open-hearth steel buildings for the Trumbull Steel Company, Warren, Ohio. The McClintic-Marshall Company has taken 1650 tons for the 239th Street subway yard in New York City, 800 tons for the Neville Island bridge for the Pittsburgh & Lake Erie Railroad, and about 1000 tons of miscellaneous jobs. The Fort Pitt Bridge Works has taken 700 tons of bridge work for the Cincinnati, Hamilton & Dayton. The Carnegie Steel Company will furnish 5000 tons of plain structural steel to Canadian fabricators who will construct another span for the Quebec bridge. It is likely the St. Lawrence Bridge Company will fabricate this material. The Baltimore & Ohio Railroad has distributed orders for some small bridges among several independent shops, calling for about 500 tons of steel, and the Pennsylvania has an inquiry out for about 1500 tons of shapes for small bridges. The Kauffman warehouse to be erected in this city will take about 1000 to 1500 tons of steel shapes and reinforcing bars. The minimum price on beams and channels up to 15-in. is now 2.70c. at mill for delivery in second and third quarters of next year. Small lots from stock for reasonably prompt shipment bring 3c. to 3.25c., Pittsburgh.

Tin Plate.—The Jones & Laughlin Steel Company, Phillips Sheet & Tin Plate Company, McKeesport Tin Plate Company and Trumbull Steel Company have announced their price on tin plate for the first six months of 1917 at $6 for primes, 100 lb., 14 x 20 plates, f.o.b. Pittsburgh. It is stated that the contracts for next year will be binding on both parties, not subject to cancellation. On Monday and Tuesday of this week eight of the sales managers of the American Sheet & Tin Plate Company were in Pittsburgh attending a conference, and were advised of how much tin plate will be allotted to them for their own particular territories, and the independent companies will follow the same policy. This year it is not going to be a question of price but of delivery, as indications are there will not be enough tin plate to go round. After the mills have allotted their output to their regular customers they will sell any surplus they may have at good prices, which from all indications will be considerably above $6 per base box. The American Sheet & Tin Plate Company has not announced its price for the first half of next year, but will do so on Thursday morning, Oct. 12. The company is out of the market as a seller of tin plate for this year and, with independent mills, will carry over into 1917 at least two months' and possibly more production. These contracts will be cleaned up as rapidly as possible and the new contracts at the $6 price will then be started on. With present prices of sheet bars and pig tin, the price of $6 for tin plate is regarded as fair to the mill and to the customer; but consumers who do not have regular sources of supply will probably have to pay a good deal more than $6 per box for their tin plate for next year. The situation in this trade is without precedent, and has made it necessary for the mills to allot their output to regular customers in order to distribute their product as equitably as possible. We now quote tin plate at $6 per base box for 100 lb., 14 x 20, for delivery over the first half of 1917.

Sheets.—As is the case with tin plate, the American Sheet & Tin Plate Company has decided to allot its output of sheets for the first half of next year, and its prices on these products will be announced on Thursday morning, Oct. 12. It looks as though practically the same conditions will prevail in the sheet trade for the first half of 1917 as in the tin-plate trade. Several of the leading mills have put their prices on Bessemer black sheets at 3.25c. for delivery in the first half. Others are still naming 3.15c., which seems to be the minimum of the market. On blue annealed prices range from 3c. to 3.25c., the latter figure being quoted by several of the larger makers. It is probable this week two or three of the leading makers of blue annealed sheets will announce their minimum price on Nos. 9 and 10 gages as 3.25c. for shipment in the first half. We now quote Nos. 9 and 10 blue annealed sheets at 3c. to 3.25c.; No. 28 black, 3.10c. to 3.25c.; No. 28 galvanized, 4.25c. to 4.40c.; Nos. 22 and 24 black plate, tin mill sizes, H. R. & A., 3c. to 3.10c.; Nos. 25, 26 and 27, 3.10c. to 3.20c.; No. 28, 3.20c. to 3.30c., and No. 29, 3.30c. to

3.40c. These prices are for carloads and larger lots, f.o.b. mills, Pittsburgh.

Rivets.—The new demand is heavy from boiler shops and structural concerns, and rivet makers are filled up for the remainder of this year and are entering contracts for delivery in the first quarter and first half of 1917. There is an insistent export demand for rivets, but on some of these inquiries local makers are not quoting, as they cannot make the deliveries. It is stated the unevenness in prices among jobbers has largely disappeared, and they are now quoting the usual differentials over mill prices. Makers' quotations are as follows: Buttonhead structural rivets, ½ in. in diameter and larger, $4 per 100 lb., base, and conehead boiler rivets, same sizes, $4.10 per 100 lb., base, f.o.b. Pittsburgh. Terms are 30 days net, or one-half of 1 per cent for cash in 10 days.

Railroad Spikes and Track Bolts.—The new demand for railroad spikes is heavier than for some time and prices are very firm. The Pennsylvania Lines West recently placed about 30,000 kegs, divided among three makers. The Baltimore & Ohio is in the market for its 1917 requirements of spikes, and the Chicago Great Western and the Vandalia have recently placed fair-sized orders. Railroad spikes are selling at $1 per ton less than the price of steel bars, and some makers believe that an early advance in prices is likely. The demand for track bolts is heavy, inquiries being in the market for round lots from a number of the leading roads. We quote track bolts with square nuts at 4.50c. to 4.75c. to railroads and 5c. to 5.25c. in small lots to jobbers, base. Track bolts with hexagon nuts take the usual advance of 15c. per 100 lb. Prices on spikes are as follows:

Standard railroad spikes, 4½ x 9/16 in. and larger, $2.65 to $2.75; railroad spikes, ½ and 7/16 in., $2.75 base; railroad spikes, ⅜ in. and 5/16 in., $3.05 base; boat spikes, $2.80 base, all per 100 lb. f.o.b. Pittsburgh.

Iron and Steel Bars.—The minimum mill price on steel bars is now 2.70c. at mill for indefinite delivery, which would probably not be before the second or third quarter of 1917, nearly all mills being sold up over the remainder of this year and largely through the first half of 1917. The new demand is heavy. Export inquiry for steel rounds is still large and in some cases small ingots are being bought which are being machined into rounds for shrapnel. Specifications from car-builders are heavier than for some time and from the implement trade are also very active. It is said that orders for steel bars from the implement trade are much larger this year than for a long time. The new demand for iron bars is active and prices are very strong. We quote steel bars at 2.70c. at mill for delivery in the first quarter and first half of 1917, while for shipment from warehouse stocks prices rule as high as 3.25c. We quote refined iron bars at 2.75c. to 2.85c., and railroad test bars at 2.85c. to 2.90c., f.o.b. Pittsburgh.

Cold-Rolled Strip Steel.—Several makers have opened their books on contracts for cold-rolled strip steel for the first quarter and first half of 1917 at the present price, which is $6 per 100 lb., f.o.b. Pittsburgh. Nearly all consumers are covered over the remainder of this year. A large amount of cold-rolled strip steel will be carried over into next year on old contracts, some of which are at less than the $6 price. We quote cold-rolled strip steel at $6, base, on contracts for delivery through the first quarter and first half of 1917, and $6.50 to $6.75 in small lots for prompt shipment. Terms are 30 days net, less 2 per cent off for cash in 10 days, delivered in quantities of 300 lb. or more when specified for at one time.

Wire Rods.—As in the case of wire products, there is an acute shortage in the supply of rods, and consumers who have to buy in the open market are having much trouble in getting them. It is said that up to $62 has been paid for ordinary soft rods for delivery over the next three or four months. Prices range all the way from $50, which is made only to consumers who make products that enter into competition with mills that make their own rods, up to $60, and as high as $65 per net ton. It would take a very exceptional order to be placed at the lower price. We therefore quote soft Bessemer, open-hearth and chain rods at $55 to $60 per ton, f.o.b. Pittsburgh.

Nuts and Bolts.—Most consumers are covered over the remainder of this year, and new inquiries now are for delivery in the first quarter and first half of next year, and it is understood some contracts have been closed for these deliveries. Prices are very firm. Deliveries of steel bars by the mills are reported unsatisfactory, and are restricting the output of nuts and bolts a good deal. Prices are firm and an advance in the near future is not unlikely. Discounts are as follows, delivered in lots of 300 lb. or more, where the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days:

Carriage bolts, small, rolled thread, 50 and 5 per cent; small, cut thread, 40, 10 and 5 per cent; large, 35 and 5 per cent.

Machine bolts, h. p. nuts, small, rolled thread, 50 and 10 per cent; small, cut thread, 50 per cent; large, 40 and 5 per cent.

Machine bolts, c. p. c. and t. nuts, small, 40 and 10 per cent; large, 35 per cent. Blank bolts, 40 and 5 per cent. Bolt ends, h. p. nuts, 40 and 5 per cent; with c. p. nuts, 35 per cent. Rough stud bolts, 15 per cent. Lag screws (cone or gimlet point), 50 and 5 per cent.

Forged set screws and tap bolts, 10 per cent. Cup and round point set screws, case-hardened, 60 per cent. Square or hexagon head cap screws, 55 per cent. Flat, button, round or fillister head cap screws, 30 per cent.

Nuts, h. p. sq., tapped or blank, $2.70 off list; hex., $2.70 off. Nuts, c. p. c. and t. sq., tapped or blank, $2.40 off; hex., $2.80 off. Semi-finished hex. nuts, 60 and 5 per cent. Finished and case-hardened nuts, 60 and 5 per cent.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 5 per cent.

Wire Products.—It is stated, but not officially confirmed, that the long expected advance in prices will take place late this week, to become effective from Monday, Oct. 16. Both the export and domestic demand for wire nails and barb wire are still very heavy. The output of nails for this year is practically under contract and in barb wire the mills report they could make sales abroad at higher than domestic prices if they could make the deliveries wanted. Specifications are large and it is still insisted that there will not be enough barb wire and wire nails to meet the demand this fall. Prices to the large trade in effect at this writing are as follows: Wire nails, $2.60, base, per keg; galvanized, 1 in. and longer, including large head barbed roofing nails, taking an advance over this price of $2, and shorter than 1 in., $2.50. Bright basic wire is $2.65 per 100 lb.; annealed fence wire, Nos. 6 to 9, $2.55; galvanized wire, $3.25; galvanized barb wire and fence staples, $3.45; painted barb wire, $2.75; polished fence staples, $2.75; cement-coated nails, $2.50, base, these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing remain at 60 per cent off list for carload lots, 59 per cent for 1000-rod lots, and 58 per cent for small lots, f.o.b. Pittsburgh.

Shafting.—Some contracts for cold-rolled and cold-drawn shafting have been made for delivery in the first quarter and first half of 1917 at 15 per cent off the list, but on a few of the most desirable of such contracts it is said the discount was 20 per cent off. The output of shafting is sold up for this year and on small current orders for delivery in two to three months about 10 per cent off the list is quoted. Some large inquiries are in the market for first quarter and first half delivery. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots for delivery in the last quarter of this year and first quarter of 1917, and 10 per cent off in less than carload lots, f.o.b. Pittsburgh, freight added to point of delivery.

Merchant Steel.—Mills report the new demand strong and say that instead of catching up on shipments they are getting further behind. Specifications against contracts are active and if nothing unusual happens the output and shipments this month may break all records. In the matter of shipments this

depends largely upon the car supply, which is none too good at present. For small lots, prices are a sfollows: Iron-finished tire, ½ x 1½ in. and larger, 2.60c., base; under ½ x 1½ in., 2.75c.; planished tire, 2.75c.; smooth channel tire, ¾ to ⅞ and 1 in., 2.85c. to 2.90c.; 1⅛ in. and larger, 3.10c.; toe calk, 3.10c. to 3.15c., base; flat sleigh shoe, 2.75c.; concave and convex, 2.85c.; cutter shoes, tapered or bent, 3.25c. to 3.35c.; spring steel, 3.25c. to 3.50c.; machinery steel, smooth finished, 2.90c. to 3c., all f.o.b. at mill.

Hoops and Bands.—The new demand is active, in spite of the fact that most consumers are covered over the remainder of this year, and specifications against contracts are coming in freely. Two of the largest makers have not yet opened their books for contracts for delivery in the first quarter and the first half of next year, but will likely do so in a short time. Steel hoops remain firm at 3c. and bands at 2.60c., with extras on the latter as per the steel bar card, but it is expected that prices on bands will be higher in the near future.

Wrought Pipe.—It is understood that the 560 miles of 8-in. and 220 miles of 6-in. line pipe bought recently by the Sinclair Oil & Refining Corporation will be delivered in very quick time, considering the congested condition of the pipe mills, in order that the company can lay this line this fall before the ground freezes. The new demand for tubular goods is heavy. The mills are sold up for four or five months on lap-weld pipe and oil country goods, but on butt-weld sizes fairly prompt deliveries can be made. The Jones & Laughlin Steel Company is now operating one of its butt-weld pipe furnaces at Aliquippa, Pa., and expects to have the other, and also the two lap-weld furnaces, on before the close of this year. Discounts on iron and steel pipe, which are firmly held, are given on another page.

Boiler Tubes.—The demand for locomotive and merchant tubes is still very great, but mills are sold up for six to eight months and several of the largest are not taking new orders for delivery before the second and third quarters of 1917. On seamless steel tubing the makers have sold practically their entire output for all of next year. Prices on iron and steel tubes are very strong. Discounts are given on another page.

Coke.—The market is active for both prompt and contract coke. A considerable range prevails in prices at which contracts are being closed. One leading Eastern consumer has bought 15,000 tons for delivery over all of 1917 at $2.65 per net ton at oven, while on another contract for 10,000 tons per month, over all of 1917, $3 was paid. A Shenango Valley furnace interest has closed for about 5000 tons of high grade coke per month for the first half of 1917 at $3.25 at oven, and another furnace interest is reported to have paid $3.50 for 10,000 tons per month over the first half of 1917. Some of the coke companies are quoting $3.50 on contract coke and will not accept less, while some grades can be bought readily at $3 and $3.25. An Eastern steel company is expected to close shortly for 50,000 to 60,000 tons of furnace coke per month for all of next year, and another interest is about to close for 15,000 tons per month for the first half. There is a scarcity in the supply of prompt furnace coke and it has sold at $4 to $4.25 at oven. Scarcity of labor and high prices ruling for coal are given as the main causes of the higher prices for coke. Some of the coke makers believe that they will soon be able to obtain $3.50 for their coke for next year, and for this reason are not in a hurry to close contracts. We quote best grades of prompt furnace coke at $4 to $4.25, and on contracts, from $3 up to $3.50 per net ton at oven. Best grades of 72-hr. foundry coke are held at $3.50 to $3.75 for prompt shipment, and from $3.75 to $4 per net ton at oven on contracts. The output of coke in the upper and lower Connellsville regions for the week ended Sept. 30 was 412,364 net tons, an increase over the previous week of 7764 tons.

Old Material.—The local market is much better, both in demand and prices. Two local consumers that have not been buying for some time have lately taken in some fair-sized lots of heavy steel scrap, paying as high as $18, delivered. There is also a good demand for low phosphorus melting stock, which has advanced fully $1 per ton, and borings are also quite active, at slightly higher prices. Dealers believe that with the heavy advances in Bessemer and basic pig iron they will soon get more money for scrap and therefore are not anxious to sell. There is a heavy demand for rerolling rails, large quantities of which have recently been sold for export at good prices. We note sales of 5000 to 6000 tons of heavy steel scrap at $17.50 to $18, delivered; 2000 to 3000 tons of low phosphorus melting stock at about $22, delivered, and 1200 to 1500 tons of borings at $9.25 to $9.50, delivered. Prices now being quoted by dealers for delivery in Pittsburgh and points that take the same rates of freight, per gross ton, are as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge Sharon, Monessen, Midland and Pittsburgh, delivered	$18.00 to $18.25
No. 1 foundry cast	16.00 to 16.25
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	19.00 to 19.25
Hydraulic compressed sheet scrap	14.50 to 14.75
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	11.50 to 11.75
Bundled sheet stamping scrap	11.00 to 11.25
No. 1 railroad malleable stock	15.25 to 15.50
Railroad grate bars	11.25 to 11.50
Low phosphorus melting stock	21.50 to 22.00
Iron car axles	35.00 to 36.00
Steel car axles	36.00 to 37.00
Locomotive axles, steel	38.00 to 39.00
No. 1 busheling scrap	14.00 to 14.25
Machine-shop turnings	7.50 to 7.75
Old carwheels	14.50 to 14.75
Cast-iron borings	9.00 to 9.25
*Sheet-bar crop ends	19.00 to 19.25
No. 1 railroad wrought scrap	19.00 to 19.25
Heavy steel axle turnings	10.50 to 11.00
Heavy breakable cast scrap	13.00 to 13.50

*Shipping point.

Chicago

CHICAGO, ILL., Oct. 11, 1916.—(*By Wire.*)

Despite high prices and the indefiniteness of deliveries, bookings of rolled steel again mounted to exceptionally large totals last week. A conservative reckoning of orders placed at Chicago would show not less than 275,000 tons. Of this approximately 100,000 tons will go into cars; 35,000 tons, plates and bars for ship building and miscellaneous export requirements; 20,000 tons, rails, and similarly large quantities of other forms. A round tonnage of forging billets for local work was bought at $65, f.o.b. mill. The freedom with which buyers, including the large jobbers of steel, are engaging to take materials at the existing level of prices has no parallel. It represents necessity on the one hand and confidence in the duration of conditions on the other. The leading independent mill has announced an absolute withdrawal from the market affecting all of its products. Its entire output of semi-finished steel for the first half is sold, including new capacity not yet completed. The attitude of the railroads is indicated in the inquiry for tie-plates. In the face of an advance to $54 per ton, one road was insistent on the booking of 3000 tons. Car purchases reported in the week totaled 6750, not including orders for trucks and various miscellaneous lots. An increased demand for light gage black sheets for export has arisen, one inquiry for 1500 tons for Japan being noted. Mill prices have advanced, and 3.25c., Pittsburgh, for No. 28, is a common quotation. Jobbers also are asking higher prices for black and galvanized sheets and for bolts and nuts. The buying of pig iron shows signs of having passed the high point of the present movement, both in the number of transactions and the quantities involved. Considerable inquiry remains to be closed. Prices show the further effects of the heavy buying, and advances are recorded for charcoal, malleable Bessemer and Northern and Southern foundry irons. Prices of scrap have moved up sharply. Sales are more frequent, and melters more interested but labor and car shortage are contributing to the scarcity of available scrap.

(By Mail)

Pig Iron.—The buying of pig iron has continued freely, although not at the rate of the preceding week, neither in respect of the number of transactions nor the

size of individual lots. The market activity still represents a widespread interest, leaving, it is reported, a considerable number of foundries still unprovided for. The continuance of demand at the rate maintained in the latter part of September and the first week of October through a much longer period could hardly have been expected without a suspicion of speculative purchases. With the advance of $1 per ton in the price of charcoal iron, announced by the leading interest, prices have also been advanced for malleable Bessemer and strong Northern iron. A minimum price of $19 at the furnace is now asked for the lower grades of charcoal iron and for malleable Bessemer $19.50 is quoted. High phosphorus Northern iron has advanced with the price of Southern foundry, the minimum quotation now being equivalent to $15, f.o.b. Birmingham. For Southern iron, only one large furnace interest is known to be selling freely at $15, prices ranging from that to $16. Numerous sales at the lower price are reported, an aggregate of 10,000 tons being a conservative estimate of business placed at that figure. Charcoal iron has been selling in quantity, and the furnace position as to stocks suggests the firmer attitude that has been taken. The local makers of ferromanganese report a much more receptive market for their product. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of $1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	$20.75
Lake Superior charcoal, No. 1	21.25
Lake Superior charcoal, No. 6 and Scotch	21.75
Northern coke foundry, No. 1	19.50 to 20.00
Northern coke foundry, No. 2	19.00 to 19.50
Northern coke foundry, No. 3	18.50 to 19.00
Southern coke, No. 1 f'dry and 1 soft	19.50 to 20.00
Southern coke, No. 2 f'dry and 2 soft	19.00 to 19.50
Malleable Bessemer	19.50
Basic	19.50
Low phosphorus	34.00
Silvery, 8 per cent	29.50
Bessemer ferrosilicon, 10 per cent	33.50

Rails and Track Supplies.—Many indications point to the difficulty of securing materials as the only curb upon the eagerness of railroads to buy supplies and equipment. At St. Louis three railroads have been in the market for tie-plates, one for as much as 3000 tons. The Terminal Railroad at St. Louis is understood to have closed for iron tie plates within the past week. Quotations for steel plates have been advanced to $54. Domestic rail sales last week amounted to 20,000 tons and the inquiry from British Columbia is still under consideration. Local mills have declined to quote on rails for export in the amount of about 30,000 tons. Thus far no business has been taken in the West for delivery in 1918. Quotations are as follows: Standard railroad spikes, 2.75c. base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie-plates, $52 to $54, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, $33, base; open-hearth, $35, light rails, 25 to 45 lb., $40; 16 to 20 lb. $41; 12 lb., $42; 8 lb., $43; angle bars, 2c., Chicago.

Structural Material.—The buying of cars in large numbers was continued last week, and it is estimated that orders placed for car steel at Chicago approximate 100,000 tons. The Pullman Company will build 2000 cars for the Western Maryland, while the New York Central Lines have placed orders for a total of 4750 cars in addition to buying trucks for 2000 cars. Further inquiry from another road for 2000 cars is under consideration. The American Bridge Company took the contract for 1100 tons of ore spouts for the Chicago & Northwestern Railway Company dock at Ashland and the Kenwood Bridge Company the order for 1300 tons for machine shop and yard crane runway extensions for the Pullman Car Works. The quotation of 2.70c., Pittsburgh, appears to be the minimum price now obtainable on plain material and one large interest is selling Bessemer shapes for delivery in the last and first quarter at 2.85c. Except for small tonnage requirements for prompt shipments, the buying of structural material seems to have been largely covered in the closing of contracts at 2.60c., immediately preceding the advance. We quote for Chicago delivery of structural steel from mill 2.889c.

We quote for Chicago delivery of structural steel out of jobbers' stocks, 3.25c.

Plates.—Fully 30,000 tons of plate and bar steel, largely for shipbuilding in the Orient, was sold last week. High prices apparently place no limitation upon the demand and the Indiana Harbor mill has had recourse to complete withdrawal from the market as the only refuge against the insistent demand. We quote for Chicago delivery of plates from mill, at its convenience, 3.189c. For prompt shipment we quote 3.439c. to 3.689c. in widths up to 72 in., and for wide plates 4.189c.

We quote for Chicago delivery of plates from jobbers' stocks, 3.75c.

Sheets.—Both the American Sheet & Tin Plate Company and the Inland Steel Company have withdrawn all quotations and are considering no further inquiry for sheets. Such mills as are quoting are asking 3.25c., Pittsburgh, for black sheets, although some of the mills are taking care of their trade at prices as low as 3.15c. Demand for sheets has been featured by large inquiry for export, especially in the last week, for light sheets. Of this the major portion has been from the Orient, one inquiry for 1500 tons for Japan being illustrative. Indications point to the purchase of these black sheets in lighter gages as intended for galvanizing in Japan. The demand for the heavier gages also persists. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.439c.; box annealed, No. 17 and lighter, 3.189c. to 3.289c.; No. 28 galvanized, 4.439c.

Prices for black and galvanized sheets out of stock have been advanced from $2 to $4 per ton and we quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.40c.; No. 28 black, 3.45c. to 3.55c.; No. 28 galvanized, 4.75c. to 4.85c.

Bars.—Sales of mild steel bars for miscellaneous consumption were large in the last week and for ship and car building purposes were especially heavy. Bessemer mild steel bars are obtainable from some of the Eastern mills for delivery in 60 to 90 days at a price of 2.75c., Pittsburgh, and some sales are noted on this basis. The scarcity of semi-finished steel, particularly in the form of forging billets, continues to be emphasized in sales at $65 and $70, f.o.b. mill, one transaction of the past week involving a round tonnage at the lower price. An inquiry for 250 tons of 9-in. and 10-in. forging billets has gone the round of the mills without any takers. For iron and rail-carbon bars, the mill situation promises to be much tighter than it has been. We quote mill shipment, Chicago, as follows: Bar iron, 2.35c.; soft steel bars, 2.789c.; hard steel bars, 2.50c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.25c.; bar iron, 3.25c.; reinforcing bars, 3.25c. base with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting net list.

Wire Products.—The ease with which some of the mills are able to secure an advance of $2 per ton for wire products for only moderately prompt delivery gives point to the expectation of a further advance in quotations. Demand for wire nails and barb wire continues strong. We quote as follows per 100 lb.: Plain wire, Nos. 6 to 9, base, $2.839; wire nails, $2.789; painted barb wire, $2.939; galvanized barb wire, $3.639; polished staples, $2.939; galvanized staples, $3.639; all Chicago.

Rivets and Bolts.—The makers of bolts and nuts, already sold up nearly to capacity, are now confronted not only by the tardy and somewhat unexpected demand from the implement interests but also by large inquiries from the railroads. The difficulty of securing materials of construction for plant extensions, long delays in the delivery of machinery and labor shortage practically limit increases in productive capacity, and relief from the existing situation appears remote. We quote as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 50-5; cut thread, 40-10-2½; larger sizes, 35-2½; machine bolts up to ⅜ x 4 in., rolled thread, with hot

pressed square nuts, 50-10; cut thread, 50; large size, 40-5; gimlet-point coach screws, 50-5; hot pressed nuts, square, $2.70 off per 100 lb.; hexagon, $2.70 off. Structural rivets, ¾ to 1¼ in., 4c. to 4.15c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Store prices for bolts have been advanced and we quote as follows: Structural rivets, 4c.; boiler rivets, 4.10c.; machine bolts up to ⅞ x 4 in., 50; larger sizes, 40-5; carriage bolts up to ⅞ x 6 in., 40-10; larger sizes, 35-5; hot pressed nuts, square, $3, and hexagon, $3 off per 100 lb.; lag screws, 50-5.

Cast-Iron Pipe.—The expected award of 30,000 tons of pipe at Detroit represents one of the largest municipal lettings of recent years. Aside from this business and 600 tons to be placed at West St. Paul, Minn., there is little inquiry. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $34.50; 6 in. and larger, $31.50, with $1 extra for Class A water pipe and gas pipe.

Old Material.—In the past week, prices of nearly all grades of scrap were sharply advanced. The apparent shortage of old material which has been attributed to labor scarcity at dealers' yards and with the railroads, preventing the collection of scrap, has been augmented by the holiday period of the last two weeks. Many grades of scrap are, for the present, difficult to secure. On the other hand, several of the leading consumers, particularly among the rolling mills, are known to have reached a point where their stocks need replenishing. A railroad is understood to have sold rerolling rails in quantity for Ohio delivery at $19.50, iron angles brought as high as $21.15, No. 1 wrought has been selling freely on the basis of $17.50, while transactions in No. 2 wrought are noted at prices in excess of $15.75 per net ton. Railroad offerings of scrap are somewhat heavier and include 3300 tons from the Michigan Central, 3200 tons from the Big Four and smaller lots from the Milwaukee road and Soo Line. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	$20.00 to $20.50
Relaying rails	19.50 to 20.50
Old carwheels	12.50 to 13.00
Old steel rails, rerolling	19.00 to 19.50
Old steel rails, less than 3 ft	18.25 to 18.50
Heavy melting steel scrap	16.50 to 17.00
Frogs, switches and guards, cut apart	16.50 to 17.00
Shoveling steel	15.50 to 16.00
Steel axle turnings	8.75 to 9.25

Per Net Ton

Iron angles and splice bars	$21.00 to $21.50
Iron arch bars and transoms	22.25 to 22.75
Steel angle bars	15.75 to 16.25
Iron car axles	30.00 to 30.50
Steel car axles	32.50 to 33.50
No. 1 railroad wrought	17.50 to 17.75
No. 2 railroad wrought	16.75 to 17.25
Cut forge	16.00 to 16.50
Pipes and flues	12.25 to 12.75
No. 1 busheling	14.75 to 15.25
No. 2 busheling	10.00 to 10.50
Steel knuckles and couplers	14.75 to 15.00
Steel springs	15.25 to 15.50
No. 1 boilers, cut to sheets and rings	10.75 to 11.25
Boiler punchings	14.50 to 15.00
Locomotive tires, smooth	22.75 to 23.25
Machine-shop turnings	5.50 to 6.00
Cast borings	6.75 to 7.25
No. 1 cast scrap	13.25 to 13.50
Stove plate and light cast scrap	10.00 to 10.50
Grate bars	10.75 to 11.25
Brake shoes	10.50 to 11.00
Railroad malleable	12.00 to 12.50
Agricultural malleable	11.25 to 11.75

Philadelphia

PHILADELPHIA, PA., Oct. 10, 1916.

The quotations for low-phosphorus pig iron continue to soar, and close to $40 has been paid for high-grade iron; but of greater interest is the strength that has developed in foundry iron, which has long been a laggard. For one brand of eastern Pennsylvania No. 2 X, $22, furnace, is quoted, while other sellers want at least $21, furnace. The spread of prices is unusually wide, depending on the extent to which the furnaces concerned are sold ahead. More iron would be consumed were it not for difficulty in securing molders and other foundry labor. Southern irons show added strength, but Virginia quotations are unchanged. Apprehension is beginning to be felt over the ore supply, inasmuch as some which is contracted for is not yet down the Lakes. Much depends on how long Lake navigation will remain open. Meanwhile there is no business in foreign ore, and no prospect of any. About the only tangible effect of the German submarine activity off Nantucket Island was the strengthening of domestic ferromanganese. The plate makers are more than ever swamped with business. Billets are stronger and sheets have a better tone. Prompt coke is scarce, and made more so by the refusal of certain railroads to permit its delivery in box cars, these being needed for other purposes. The old-material market has a better tone.

Pig Iron.—The actual price levels of most grades of iron are difficult to gage because of the uniformly bullish sentiment on the part of producers and their representatives. They report that the market has continued fairly active, and are firm in the belief that it will become more so. No large sales have been made, but the aggregate of moderate-sized orders from miscellaneous directions has been good. In the business done, some sellers see a greater demand for prompt shipments. Foundries continue to be hampered by a shortage of help, particularly molders, some of whom work but intermittently while others utilize the demand for their craft to change the place of their employment frequently. Founders complain that, whereas they were starving for work not long ago, they are now obliged to turn business away because of the lack of labor. Despite these conditions, the absorption of iron has been such that many Northern furnaces are booked with orders to an extent that appears to justify advances in price. The cost of production is greater, several furnaces having paid $4 for prompt coke, which is an added influence making for higher pig-iron prices. One eastern Pennsylvania furnace, the product of which takes a freight rate of 79c. to Philadelphia, quotes $22, furnace. For another brand $21.40, delivered, is quoted, and $21, furnace, is not unusual. It is safe to say the higher figure has not yet been paid unless in exceptional cases. A few thousand tons of pipe iron have been taken, most of it Southern iron, which is stronger at $14.50 to $15, Birmingham, for No. 2, delivery over the remainder of the year, and $15 to $16 for first quarter. In Virginia iron there is no change in price, although the makers have done a heavy business since they made their quotation $17.50, furnace, or $20.25, Philadelphia. Basic is quiet but very firm, and only a test would determine how much could be obtained at $20 to $20.50, delivered. In the past week prices of low phosphorus have been on the upgrade, and several thousand tons have been taken at prices ranging from $35 to $38, delivered, according to analysis and other conditions, and sales at close to $40, delivered, are reported. For standard low phosphorus $37 to $40, delivered, is quoted, the top of the range being for pig iron with not over 0.03. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa. No. 2 X foundry	$20.00 to $20.50
Eastern Pa. No. 2 plain	19.75 to 20.00
Virginia No. 2 X foundry	20.25
Virginia No. 2 plain	20.00
Gray forge	18.75 to 19.25
Basic	20.00 to 20.50
Standard low phosphorus	37.00 to 40.00

Iron Ore.—The possibility of new business in foreign ore is temporarily, at least, made more remote by German submarine activity on this side of the Atlantic. A further detriment is that not only has the marine-insurance rate been advanced but American ships cannot be insured against capture. Eastern Pennsylvania furnace operators are also expressing apprehension over the possibility of their not receiving all the Lake Superior ore they have under contract. Some business in Indian manganese ore has been done. In the week ended Oct. 7, 5899 tons of Swedish ore arrived at this port.

Ferroalloys.—The agents of English makers quote $165, seaboard, for 80 per cent ferromanganese, but this price is subject to confirmation from abroad. Domestic material has been offered in the Middle West at $160, delivered. On the other hand, a domestic maker in the East withdrew his price following news of the recent German submarine activity. The report that a Buffalo furnace is to go on ferromanganese is con-

firmed by the fact that the lessee has available a few thousand tons of manganese ore. In the week ended Oct. 7, arrivals of English ferromanganese at this port aggregated 930 tons. Blast-furnace ferrosilicon, 11 per cent, is quoted at $35.44, delivered. While $87 to $89, Pittsburgh, is nominally quoted for 50 per cent ferrosilicon, $91 has been paid for delivery over the remainder of the year, the sellers not being willing to contract into 1917.

Plates.—With most makers the principal question is not one of price but of deliveries. They are selecting the business they care for and can fill. Their minimum for tank steel is 4c., Pittsburgh, or 4.159c., Philadelphia. Steel for marine boilers is quoted at 8c. to 10c. per pound, taking an extra of 40c. per 100 lb. as well as the usual 15.9c. for freight. One maker has in hand an inquiry for 40,000 tons of ship plates and shapes for export, but does not see how he can handle any of it. A large tonnage for pipe-line work is going begging. A local shipyard which had an option on a quantity of plates was offered $60,000 for it. Makers have been invited to bid on deliveries to be made in the latter part of 1917 and even early 1918. A maker whose quotation has been the minimum is practically filled up for the year and has advanced his quotation, but still will consider 3.659c., Philadelphia.

Bars.—The market is strong and active at 2.859c., Philadelphia, for steel bars and 2.659c. for iron bars.

Structural Material.—The contract for the Southern Hotel, Baltimore, Md., has been placed with Dietrich Bros., of that city. It involves 2000 tons. Shapes continue in demand in many directions, despite the lack of noteworthy building projects. Quotations range from 2.859c. to 3.009c., Philadelphia, for structural material and up to 3.659c., Philadelphia, for ship shapes. One mill is not taking contracts into next year, although some of its 1916 commitments will run over.

Billets.—Open-hearth rerolling billets are stronger at $50, Eastern mill, while forging steel is quoted at $65 to $75, according to specifications. The demand is heavy, especially from export sources. Makers of shell forgings are looking for steel also.

Sheets.—Quotations for No. 10 blue annealed still range from 3.159c. to 3.409c., Philadelphia, but the market has a stronger tendency.

Coke.—Furnaces have paid up to $4 per net ton at oven for spot furnace coke, and up to $4.25 is asked. Contract is around $3.25. Prompt foundry is stronger at $3.75 to $4 at oven, with contract foundry unchanged at $3.50 to $3.75. The situation in prompt coke is made worse by the refusal of certain railroads to ship in box cars. Freight rates from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Old Material.—The mills have not yet taken any heavy melting steel, but they are more active with regard to other items. Steel is stronger because of buying at Pittsburgh. Rerolling rails are scarce. The embargoes have been raised at all places except Burnham, Pa., and a few carloads have got into that place. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to $1.35 per gross ton, are as follows:

No. 1 heavy melting steel	$15.50 to $16.00
Old steel rails, rerolling	18.50 to 19.00
Low phos. heavy melting steel scrap	21.25 to 23.50
Old steel axles (for export)	35.00 to 36.00
Old iron axles (for export)	35.00 to 36.00
Old iron rails	21.00 to 22.00
Old carwheels	15.50 to 16.00
No. 1 railroad wrought	22.00 to 22.50
Wrought-iron pipe	16.00 to 16.50
No. 1 forge fire	12.00 to 12.50
Bundled sheets	12.00 to 12.50
No. 2 busheling	10.50 to 11.00
Machine-shop turnings	8.00 to 8.50
Cast borings	10.00 to 10.50
No. 1 cast	16.00 to 16.50
Grate bars, railroad	11.75 to 12.25
Stove plate	13.00 to 13.50
Railroad malleable	13.00 to 13.50

The McCallip Mfg. Company, maker of wire and iron work, is removing its plant from Philadelphia, Pa., to Columbus, Ohio, where it will occupy a building at Spruce Street and Dennison Avenue.

Cleveland

CLEVELAND, OHIO, Oct. 10, 1916.

Iron Ore.—Ore on Lake Erie docks Oct. 1 amounted to 7,230,024 gross tons, or only 755,000 tons less than was on the docks Oct. 1 a year ago. The dock balance increased the past month 1,440,000 tons. The large increase in ore placed on the docks in September was caused by the car shortage, and much is being placed on the docks this month that would go direct to the furnaces were cars available. The car shortage is seriously interfering with the ore movement, many boats being held at Lake Erie ports awaiting cars. Boats are being delayed from 24 to 48 hours, and it is expected that some of those now at Lake Erie ports will not get away inside of 72 hours from the time of arrival. Because of the slackening up of the ore movement shippers are not getting vessel tonnage as fast as wanted, and some who expected to get cleaned up early will probably be rushed with shipments until the close of navigation. Iron ore receipts at Lake Erie ports in September amounted to 7,871,551 gross tons out of the total Lake shipments of 9,600,786 tons. Some of the blast-furnace people are beginning to show considerable interest in next season's prices, but no prices have as yet been named. We quote 1916 prices as follows for delivery at lower Lake ports: Old range Bessemer, $4.45; Mesaba Bessemer, $4.20; old range non-Bessemer, $3.20; Mesaba non-Bessemer, $3.55.

Pig Iron.—The market is fairly active and prices are higher on all grades. Local furnaces have advanced their prices on foundry iron for Cleveland delivery about 75c. per ton, one now quoting No. 2 foundry at $20 for Cleveland delivery and another asking $20, at furnace, or $20.30 delivered. For out-of-town shipment, quotations range from $19.50 to $20. Sales are reported at $20 by Cleveland and Valley furnaces for first-half delivery. Some malleable iron has also been sold as high as $20 in the Valley, and it is believed that the $19.50 price on basic, foundry and malleable iron in the Valley will soon disappear. Bessemer iron is held at $23, Valley furnace, but a small lot is reported sold at $23.50. We note the sale of 10,000 tons of basic to a northern Ohio consumer for first-half delivery. Southern iron prices have not kept up with the advances on Northern grades, and at several northern Ohio points in close proximity to blast furnaces, Southern iron has been sold in the past few days at a delivered price of about 50c. lower than Northern grades could be secured. Some consumers who have not used Southern iron for several years are taking advantage of the lower price and placing orders for Southern grades. A number of sales are reported in lots of 500 tons and under. Minimum quotations on Southern iron are $14.50, Birmingham, for No. 2 for this year's delivery and $15 for first half. One or two producers have advanced their quotations 50c. above these prices during the past few days. Ohio silvery iron has been advanced to $28 for 8 per cent, or $1 per ton higher than the recent prevailing price. Tennessee silvery is quoted at about $24 delivered in Ohio territory. The demand for low phosphorus iron is active, and little is available for this year's delivery. There is considerable inquiry for low phosphorus iron for first half. Prices on this grade have been marked up $1 or more per ton. We quote, delivered Cleveland, as follows:

Bessemer	$23.95
Basic	$20.00 to 20.30
Northern No. 2 foundry	20.00 to 20.30
Southern No. 2 foundry	18.50 to 19.00
Gray forge	19.50
Jackson Co., silvery 8 per cent silicon	29.62
Standard low phos., Valley furnace	34.35

Coke.—The by-product coke plant of the Dover By-Product Coke Company, Canal Dover, Ohio, was placed in operation Oct. 9. It has the Roberts type of ovens and its daily capacity is about 440 tons. The foundry coke market is very firm and prices are higher. The car shortage is seriously interfering with shipments, and some consumers unable to secure Connellsville coke are placing orders for prompt shipment Virginia

coke at $4 per net ton at oven. We quote standard Connellsville foundry coke at $3.75 to $4 per net ton at oven, for prompt shipment and contract.

Finished Iron and Steel.—The demand for finished steel for early delivery continues fairly heavy, particularly for steel bars and plates. Some last quarter plate contracts with tank and boiler makers have been placed at 4c., Pittsburgh. A local mill making plates in narrow sizes has advanced its price from 3.25c. to 3.50c., Pittsburgh, and a Pittsburgh mill has advanced its price from 3c. to 3.25c. for narrow plates for future delivery. Most mills are now asking 2.70c., Pittsburgh, for steel bars and structural material for future delivery, having advanced their price from 2.60c. The Lackawanna Steel Company has taken 5000 tons of rails for the Nickel Plate Railroad. Rail inquiries in the local market include 6000 tons for export and 1500 tons for an industrial company. Among other foreign inquiries is one for 20,000 tons of rerolling billets for export to Sweden. We note the sale of a small lot of forging billets at $60, Eastern mill, although the usual quotation is $65. In structural lines 1200 tons for an addition to the John Harkness Brown Building, Cleveland, will be furnished by a leading independent mill. The McClintic-Marshall Company has taken 250 tons for new buildings for the Peerless Motor Car Company, and the Penn Bridge Company has taken 270 tons for extensions to the plant of the Atlas Car & Mfg. Company, Cleveland. Local fabricators are figuring on an inquiry from the Chicago, Burlington & Quincy Railroad for the Harrison Street terminal, Chicago, requiring 5000 tons in 1917 and 5000 tons in 1918. The Wheeling & Lake Erie Railroad has placed 1000 steel cars, dividing the order equally between the Standard Steel Car Company and the Pressed Steel Car Company. There is a heavy demand for sheets from both manufacturers and jobbers, and prices on black sheets are firmer. We quote black sheets at 3.10c. to 3.25c., Ohio mill, for No. 28; blue annealed, at 3c. to 3.10c. for No. 10, and galvanized at 4.35c. to 4.40c. for No. 28. Bar-iron prices are unchanged at 2.50c. to 2.60c., Pittsburgh. Warehouse prices are 3.40c. for steel bars and structural material; 3.75c. for plates and 3.25c. for iron bars.

Old Material.—The market is more active than for some time, particularly in heavy melting steel, and prices are firm. Heavy melting steel scrap has advanced about 50c. per ton and several other grades are higher. The Otis Steel Company bought a round tonnage at prices that are understood to range from $17.50 to $18, delivered. The Upson Nut Company is reported in the market for a round tonnage of the same grade at about $17.50. A Canton mill has taken heavy melting steel at $18 to $18.50. The advance in pig iron has forced cast scrap up about 25c. per ton. There is more activity between dealers in turnings and the price on this grade has been advanced about 25c. per ton. An embargo has been declared against the plant of the Upson Nut Company. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton

Steel rails	$15.25 to $15.75
Iron rails	18.50 to 19.00
Steel car axles	33.00 to 35.00
Heavy melting steel scrap	17.25 to 17.50
Carwheels	12.75 to 13.00
Relaying rails, 50 lb. and over	25.00
Agricultural malleable	12.50 to 12.75
Railroad malleable	14.25 to 14.50
Steel axle turnings	12.00 to 12.50
Light bundled sheet scrap	12.00 to 12.25

Per Net Ton

Iron car axles	$26.00 to $27.00
Cast borings	6.25 to 6.50
Iron and steel turnings and drillings	5.75 to 6.00
No. 1 busheling	13.25 to 13.50
No. 1 railroad wrought	16.00 to 16.50
No. 1 cast	13.75 to 14.00
Railroad grate bars	10.25 to 10.75
Stove plate	10.25 to 10.75

Bolts, Nuts and Rivets.—While the demand for bolts and nuts is not so heavy as a few weeks ago, manufacturers are getting a good volume of business for delivery during the remainder of the year. Leading manufacturers are inclined to hold off in taking orders for next year's delivery, although some business has been placed for the first quarter. Prices are firm. The demand for rivets continues fairly active. Prices are unchanged at 4c., Pittsburgh, for structural and 4.10c. for boiler rivets. Bolt and nut discounts are as follows:

Common carriage bolts, ⅝ x 6 in., smaller or shorter, rolled thread, 50 and 5; cut thread, 40, 10 and 2½; larger or longer 35 and 2½; machine bolts within h. p. nuts, ⅝ x 4 in., smaller and shorter, rolled thread, 50 and 10; cut thread, 50; larger and longer, 40 and 5; lag bolts, gimlet or cone point, 50 and 5; square h. p. nuts, blank or tapped, $2.70 off the list; hexagon h. p. nuts, blank or tapped, $2.70 off; c. p. c. and t. sq. nuts, blank or tapped, $2.40; hexagon nuts, all sizes, $2.80 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 5.

Cincinnati

CINCINNATI, OHIO, Oct. 11, 1916.—(*By Wire.*)

Pig Iron.—A prominent maker in southern Ohio has withdrawn from the market as far as prompt-shipment business is concerned, its order books being well filled for this year. However, $19, Ironton, can still be done for this year, and contracts over the first half of 1917 are solicited at the same figure. Southern iron is firmer, but for this year there is some still available at $14.50, Birmingham basis. A number of sales are being made at $15, which is the quotation of the majority of furnaces in that district. Quite a number of sales at this figure have also been made in Indiana and southern and central Ohio, among which are 1000 tons for first half delivery and several 500-ton lots. The carload business for prompt shipment is still good, but Indiana melters appear to be taking more small tonnages of iron than other sections. Virginia irons continue to be a factor in this market, and the freight rate of $1.90 from furnace added to the price of $17.50 on No. 2 X enables operators in that district to compete successfully with Ohio River iron. The general inquiry is light and business is mostly transacted by salesmen direct. Some malleable has lately been sold, the largest reported sale being 1000 tons for first half. Northern basic is temporarily at a standstill, but unconfirmed reports are to the effect that more Southern basic has been sold in this territory than is generally known. Reports received late to-day indicate that $15, Birmingham, will be the minimum for Southern iron before the end of this week. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	$17.90 to $18.40
Southern coke, No. 2 f'dry and 2 soft.	17.40 to 17.90
Southern coke, No. 3 foundry	16.90 to 17.40
Southern coke, No. 4 foundry	16.40 to 16.90
Southern gray forge	15.90 to 16.40
Ohio silvery, 8 per cent silicon	28.26 to 28.76
Southern Ohio coke, No. 1	21.26 to 21.76
Southern Ohio coke, No. 2	20.26 to 20.76
Southern Ohio coke, No. 3	19.76 to 20.26
Southern Ohio malleable Bessemer	20.26 to 20.76
Basic, Northern	20.26 to 20.76
Lake Superior charcoal	21.20 to 22.20
Standard Southern carwheel	24.90 to 25.40

(By Mail)

Coke.—The situation as far as the Connellsville district is concerned is somewhat complicated. It is known that some contracts for furnace coke have been made at $3.50 per net ton at oven for nearby shipment and long time contracts around $3. The labor shortage and the scarcity of cars have had much to do with advancing the coke price in all districts. Contracts made lately for furnace coke cover shipments of approximately 8000 tons a month to two different consumers in this territory. Connellsville foundry coke is now quoted around $3.75, and as high as $4 is asked. Pocahontas and Wise County operators are quoting on the same price level as New River operators on foundry coke.

Finished Material.—The warehouse business is rather slow and the lull is welcomed by both the mills and the jobbers. Mill shipments on old orders are going forward at a more satisfactory rate, although both manufacturers and wholesalers are not disposed to take on new business except in extreme cases where the material is needed. It is a difficult proposition now to take care of the needs of regular customers. We quote No. 28 black sheets, f.o.b. Cincinnati or Newport, Ky., at 3.40c. and No. 28 galvanized at 4.65c. Jobbers' prices are unchanged as follows: No. 10 blue annealed sheets, 3.50c.; wire nails, $2.85 per keg, base; barb wire, $3.70

per 100 lb.; steel bars and structural shapes, 3.35c.; twisted steel bars, 3.50c.; cold-rolled steel rounds, 2-in. and larger, 3.90c.

Old Material.—The market is gaining strength, although no general advances have been recorded in the past few days. The rolling mills and foundries are good customers, but practically all users are slow in making long time contracts. The policy of consumers seems to be to buy only for nearby requirements. The following are dealers' prices, f.o.b. at yards, southern Ohio and Cincinnati:

Per Gross Ton

Bundled sheet scrap	$11.50 to $12.00
Old iron rails	17.50 to 18.00
Relaying rails, 50 lb. and up	22.75 to 23.25
Rerolling steel rails	16.00 to 16.50
Heavy melting steel scrap	15.00 to 15.50
Steel rails for melting	14.50 to 15.00

Per Net Ton

No. 1 railroad wrought	$15.00 to $15.50
Cast borings	4.75 to 5.25
Steel turnings	5.00 to 5.50
Railroad cast	12.00 to 12.50
No. 1 machinery cast	14.00 to 14.50
Burnt scrap	9.00 to 9.50
Iron axles	27.75 to 28.75
Locomotive tires (smooth inside)	22.00 to 22.50
Pipes and flues	10.00 to 10.50
Malleable and steel	11.75 to 12.25
Railroad tank and sheet	9.25 to 9.75

Birmingham

BIRMINGHAM, ALA., Oct. 9, 1916.

Pig Iron.—On Oct. 4 the leading interest advanced its price of all deliveries on pig iron to $16, being well provided for, and, it is presumed, prepared to await another rise. The largest foundry producer advanced to $15.50 about the same time, and made sales both North and South. Other interests made sales at $15, which may be regarded as the minimum of date of Oct. 7. The upward trend is marked. Alabama now has four more furnaces on basic than ever before. Woodward put one on basic in July and another on Oct. 1. In the first week of October the Sloss-Sheffield changed a foundry stack over to basic at North Birmingham and blew in a City stack on basic to take care of its 100,000 tons of basic ordered by the British Government. Woodward is also manufacturing for that government. These four stacks are fully booked on basic for six months. Additional offers of basic by the British Government were declined. The two companies would scarcely have done the booking but for the consignee providing the ships. Free foundry-iron stocks would have gone below 200 000 tons in September but for the car shortage. Export metal has been shipped to New York in flat cars. An interest with bookings calling for the delivery of 1000 tons per diem is shipping only 500 tons. The car shortage is intense. One producer company is sold up for the remainder of the year and to the extent of two-thirds capacity for the first half of next year. This and another large producer are out of the market for the remainder of 1916. Sales have been enormous. One interest booked 30,000 tons in the first week of the month—all foundry iron. Consumers are not well provided for for the first half of next year and are becoming restless. The output continues at a record-breaking pace. Foundries are consuming their full quota. We quote, per gross ton, f. o. b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	$15.50 to $16.00
No. 2 foundry and soft	15.00 to 15.50
No. 3 foundry	14.50 to 15.00
No. 4 foundry	14.25 to 14.75
Gray forge	14.00 to 14.50
Basic	15.00 to 15.50
Charcoal	21.50 to 22.00

Cast-Iron Pipe.—An explosion in the old plant of the United States Cast Iron Pipe & Foundry Company at Bessemer, Ala., last Saturday, caused some damage, but will not affect operations. No large recent orders are reported. Shipments to South America have been attended with such inconveniences as to indicate that resident agents in that country will alone solve the problem. Operations continue around capacity. The Lynchburg pipe plant at Anniston is to be repaired and will resume operations. We quote, per net ton, f. o. b. pipe shop yards, as follows: 4-in., $29; 6-in. and upward, $26, with $1 added for gas pipe and 16-ft. lengths.

Coke.—The market is very strong. One interest sold 6000 tons, part Southern and part Mexican delivery, at $4 per net ton, f. o. b. oven. This is the contract price for large lots. Small lots and spot sell at $4.25 to $4.50 for standard beehive foundry, with furnace coke going at $3.25 to $3.50. Sloss-Sheffield is buying coke from Republic and Pratt Consolidated to help out in its operation of six blast furnaces.

Old Material.—Dealers report an increase in the volume of business. Wrought and steel scrap have been quite active. Shipments to Knoxville, St. Louis, Youngstown, Anniston, Alabama City and the Middle West have been on a large scale recently. Yard stocks are no longer heavy. We quote, per gross ton, f. o. b. dealers' yards, as follows:

Old steel axles	$25.00 to $30.00
Old steel rails	12.00 to 12.50
No. 1 steel scrap	11.00 to 11.50
No. 1 wrought	12.75 to 13.25
No. 1 cast	11.00 to 11.50
Stove plate and light	8.75 to 9.25
Carwheels	11.50 to 12.00
Tram carwheels	11.00 to 11.50

Buffalo

BUFFALO, N. Y., Oct. 10, 1916.

Pig Iron.—Sales for the week have aggregated 18,000 to 20,000 tons, all grades, and for deliveries extending over the rest of 1916 and the first half of next year. All of the re-sale iron in this district has now been disposed of. Inquiry continues to be quite general, although not quite so heavy in volume as a week ago. Heavy sales have caused another large producing interest to advance its price 50c. per ton today to an absolute minimum of $19.50 for any grade and making it the same as the lowest price established by other large producers a week ago. Some of the furnaces of the district are now maintaining a minimum of $20 per ton, establishing a range of $19.50 to $20.50, according to grades. There is apparently no No. 2 X iron in the district at less than $19.50, and the average price is $20 for first half delivery. We quote as follows f.o.b. furnace, Buffalo, for delivery to and including the first half of 1917:

No. 1 foundry	$20.00 to $20.50
No. 2 X foundry	19.50 to 20.00
No. 2 plain	19.50 to 20.00
No. 3 foundry	19.50 to 20.00
Gray forge	19.50 to 20.00
Malleable	19.50 to 20.00
Basic	20.00 to 20.50
Bessemer	22.00
Charcoal, regular brands and analysis	21.00 to 22.00

Finished Iron and Steel.—Demand for plates is so greatly in excess of the supply that almost any price could be secured. The minimum price of the larger manufacturers is 3½c. per pound, with no tonnage to offer to buyers, as mills have on their books sufficient orders to carry them over next year. For reasonably prompt shipment as high as 5½c. per pound has been paid. The prospects are that there will be much more tin-plate business offered to mills than can be accepted, and that mills will confine their sales to their regular established trade. It is believed that in the early part of 1917 tin plate will bring $7 or more, per base box. Not more than 75 per cent of the offerings in bars and shapes are being accepted. Sellers are compelled to turn down a large percentage of orders, even from established customers. Bids are being opened to-day for 350 tons for a barge canal bridge at Rochester, and for 1600 tons of structural steel, reinforcing bars, steel sheet piling, etc., for barge canal work at various points. The city of Buffalo will open bids next week for repairs to eight viaducts over the New York Central, Pennsylvania and Erie railroads, involving about 1000 tons of structural steel and 1000 to 1200 tons of cast-iron plates. The Hammermill Paper Mill, Erie, Pa., has awarded 400 tons of steel to the Pittsburgh Bridge & Iron Works. The American Bridge Company has booked 100 tons steel shapes for a blacksmith shop for the Morrow Mfg. Company at Elmira, N. Y.

Old Material.—Dealers of the Buffalo District report that trading in practically all lines of scrap material has become decidedly spirited in the last week. Heavy

melting steel is holding firmly at $17 to $17.50, and only small tonnages are obtainable at that figure. Advances in prices are noted in low phosphorus, wrought and cast scrap, iron and steel axles, No. 1 and No. 2 busheling scrap and car wheels. No large sales are reported as dealers are holding stock. Inquiry coming in is of very good volume and for all grades. It is stated there are no large tonnages of steel scrap available in this market. We quote dealers asking prices, per gross ton f.o.b. Buffalo, as follows:

Heavy melting steel	$17.00 to $17.50
Low phosphorus steel	21.50 to 22.00
No. 1 railroad wrought scrap	19.00 to 19.50
No. 1 railroad and machinery cast scrap	16.50 to 17.00
Steel axles	32.00 to 33.00
Iron axles	32.00 to 33.00
Carwheels	15.50 to 16.00
Railroad malleable	15.50 to 16.00
Machine shop turnings	6.00 to 6.50
Heavy axle turnings	12.00
Clean cast borings	7.50 to 7.75
Iron rails	18.00 to 18.50
Locomotive grate bars	11.50 to 12.00
Stove plate (net ton)	11.50 to 12.00
Wrought pipe	13.00 to 13.50
No. 1 busheling	14.00 to 14.50
No. 2 busheling	11.50 to 12.00
Bundled sheet scrap	11.50 to 12.00
Bundled tin scrap	15.00 to 15.50

St. Louis

ST. LOUIS, Oct. 10, 1916.

Pig Iron.—The requirements of foundries and other consumers in the St. Louis industrial district have, according to developments and investigations, been pretty well covered, as a result of the rather heavy buying which has been going on during the past several weeks, at least for the first half of 1917. In consequence, there has been some slacking up of purchases and this has been emphasized somewhat by the shortage of labor. As a result some foundries are not melting within 20 per cent of their capacity. One or two furnace representatives have been notified of a willingness of their principals to accept business for the last half of 1917 on the basis of $15.50, Birmingham, but most of the representatives are acting upon advices that their furnaces are sold up, at least as nearly so as the management desires at the present time and at present prices. The impression seems to be that advances are to be expected and furnaces represented in this territory do not desire to take any more business at current figures. Sales during the week aggregated possibly 4000 tons.

Coke.—Very little was done in the week, as consumers are covered by their contracts. Special needs are being filled in carload lot orders at prices somewhat above the market. The local by-product plant is holding its coke on a parity with Connellsville quotations.

Finished Iron and Steel.—The finished product demand is still good, but the extremely deferred deliveries prevent anything in the way of large contracting. Consumers are, however, urging the mills to take on business, which the latter are disinclined to do under present conditions. Consumers with immediate needs are continuing to take stock out of warehouses at the higher prices and passing the cost along to the consumer. For stock out of warehouse, we quote as follows: Soft steel bars, 3.30c.; iron bars, 3.20c. to 3.25c.; structural material, 3.30c.; tank plate, 3.80c.; No. 10 blue annealed sheets, 3.45c.; No. 28 black sheets, cold rolled, one pass, 3.60c:; No. 28 galvanized sheets, black sheet gage, 5.15c.

Old Materials.—The scrap market continues stiff in spite of heavy offerings by the railroads and the opinion is more definite that a shortage of considerable proportions really exists. Steel mills, foundries and rolling mills are in the market to a considerable extent, while dealers are still doing considerable buying to cover their shortages and to hold against further advances, which they expect. The irregularities of the demand at this point continue to keep some of the quotations out of line with those made in other markets. Relaying rails, standard section, are scarce and high, while a sharp new demand has sprung up for light relaying rails, with an advance in price. Lists out, closing this week, include the Vandalia, 500 tons; Kansas City Southern, 500 tons; Big Four, 3500 tons; Southern Railway, 2300 tons. The lists coming out last week and closing this week aggregated in excess of 5000 tons, but the heavy offerings had no appreciable effect on the market, which was, if anything, stronger than before the offerings appeared. We quote dealers' prices, f.o.b. St. Louis industrial district, customers' works, as follows:

Per Gross Ton

Old iron rails	$17.50 to $18.00
Old steel rails, rerolling	17.00 to 17.50
Old steel rails, less than 3 ft.	17.00 to 17.50
Relaying rails, standard section, subject to inspection	24.00 to 26.00
Old carwheels	12.00 to 12.50
No. 1 railroad heavy melting steel scrap	15.75 to 16.25
Heavy shoveling steel	15.00 to 15.50
Frogs, switches and guards cut apart	15.75 to 16.25
Bundled sheet scrap	8.25 to 8.75

Per Net Ton

Iron angle bars	$17.25 to $17.75
Steel angle bars	14.75 to 15.25
Iron car axles	28.50 to 29.00
Steel car axles	31.00 to 32.00
Wrought arch bars and transoms	20.00 to 20.50
No. 1 railroad wrought	16.25 to 16.75
No. 2 railroad wrought	15.75 to 16.25
Railroad springs	15.00 to 15.50
Steel couplers and knuckles	14.50 to 15.00
Locomotive tires, 42 in. and over, smooth inside	21.50 to 22.00
No. 1 dealers' forge	14.50 to 15.00
Cast-iron borings	6.50 to 7.00
No. 1 busheling	14.50 to 15.00
No. 1 boilers, cut to sheets and rings	10.50 to 11.00
No. 1 railroad cast scrap	12.50 to 13.00
Stove plate and light cast scrap	9.25 to 9.50
Railroad malleable	11.00 to 11.50
Agricultural malleable	10.00 to 10.50
Pipes and flues	11.00 to 11.50
Heavy railroad sheet and tank scrap	11.00 to 11.25
Railroad grate bars	10.00 to 10.50
Machine shop turnings	7.50 to 8.00

San Francisco

SAN FRANCISCO, CAL., Oct. 3, 1916.

The tonnage of new orders for finished materials in general continues very heavy. Many buyers are seeking to hasten deliveries, notwithstanding the large shipments that have been coming forward for some time on old contracts. Increasing anxiety is also noted as to supplies for the coming year, though the placing of new contracts is still limited. The activity, however, is mainly with the larger manufacturers, for special purposes, or for export. The routine jobbing business continues to be adversely affected by high prices and, though normal in most lines, shows no exceptional activity. Merchants' stocks, as a rule, are in fair shape.

Bars.—The Oriental demand is increasingly urgent, but such inquiries get little response from sellers. Local mills are not anxious to repeat last year's experience, when they tied up a large tonnage by export contracts and were unable to meet home requirements; and Eastern mills show little eagerness for business outside of their regular trade. Merchant bar specifications from implement and other manufacturers, shipbuilders, etc., continue heavy, most of their requirements being covered by contracts; while merchants' specifications are about normal for this season. The tonnage of reinforcing bars holds up well. Resale prices on merchant bars in small lots remain at 4c. for steel and 3.90c. for iron.

Rails.—There is considerable talk of extensive construction by several new railroads in Oregon and Washington, as well as by the Western Pacific, though thus far little has been heard from them in regard to rails. As for the Western Pacific, at least, it is expected that relayers will cover a large part of the extensions, which will tap several important districts. Aside from this, the greatest demand is from mining and industrial concerns. While new orders for light rails are numerous, the tonnage of relaying rails brought out by the present prices is surprising.

Structural Material.—The Union Iron Works has placed a small fabricating contract with a local concern for its new office building. Fabricators are quite busy on old work and report figuring fairly active, but new inquiries are almost entirely of a small nature, and generally in outside towns. Bridges and manufacturing plants are about the most important items.

Arrangements are about complete for the purchase of the lot at California and Montgomery streets by the Merchants' Exchange, which will build a three-story class A building adjoining its present 14-story structure. Plans are being drawn for a new Y. W. C. A. building. A deal has about been closed for the construction of a 10-story building in San Diego. The city of Sacramento will take bids Oct. 5 for a $130,000 Carnegie library. Shipbuilders and other manufacturing concerns continue actively in the market for plain shapes.

Plates.—While shipbuilders are receiving a heavy tonnage on old contracts, the deliveries are far short of requirements, and all possible efforts are being made to hasten shipments. Some new inquiries also are appearing, though it is difficult to obtain early delivery except at prices ordinarily prohibitive. Heavy shipments are now passing through here for Japan, and the demand in that country is apparently increasing. The Lacy Mfg. Company and the Llewellyn Iron Works have taken some very large contracts for riveted pipe for Los Angeles and Los Angeles County. Distributive movement is very fair, though many of the small consumers are getting delivery on special orders placed some time ago.

Sheets.—The usual run on corrugated sheets is not appearing, notwithstanding early rains. Apparently other materials are being drawn upon to provide the usual increase in country warehouse space. The recent acceleration in plain galvanized sheets, however, has kept up quite well, and blue annealed sheets also are moving somewhat better in a jobbing way. Specifications from large consumers show no curtailment, and there is considerable inquiry for early delivery, as well as efforts to cover future requirements. Black sheets are of little consequence in this market, but a few seasonable inquiries are coming out.

Tin Plate.—Export demand continues strong and insistent, and there has been great activity among local packers in contracting for next year's needs, at prices to be named later.

Wrought Pipe.—With Los Angeles aqueduct contracts amounting to about 5000 tons, and a sudden spurt of oil-field business, the local branch of the leading interest has booked about the largest month's business in its history. This was entirely unexpected, as the previous month was rather quiet, and there is nothing to indicate continued activity. Tonnage booked by other concerns, though not remarkable, was quite large, consisting principally of oil well supplies. New demand for merchant pipe from the mills has been light, and the resale business is at best not above normal.

Cast-Iron Pipe.—Corporation buying has subsided somewhat since Sept. 1, nearby requirements having been fairly well covered before that date. Small municipal inquiries are fairly numerous. Los Angeles will take bids Oct. 3 for 417 tons; the Government will take bids Oct. 5 for about 80 tons of small pipe for a fort in Arizona; Hermosa Beach, Cal., will take bids Oct. 17 for a small lot; and the city of San Francisco is expected in the market soon for a fair tonnage. Prices have advanced $1, now being $40 per net ton for 4-in.; $37 for 6-in. and larger; $1 extra for class A and gas pipe.

Pig Iron.—Another shipment of 1000 tons of Hanyang iron has arrived on old contracts. The local market is quiet and uninteresting, with heavy stocks in melters' hands; but prices are firmly held, furnace agents quoting No. 1 Southern foundry iron at $26.50 to $27 per gross ton.

Coke.—Stocks are ample for foundry requirements for two to three months ahead, and business is about at a standstill, with prices entirely nominal.

Old Material.—Steel melting scrap is in adequate supply for all nearby requirements, with a large tonnage at outside points which could easily be drawn upon. The heaviest needs are covered by contracts, and new business is limited to small transactions as a rule, prices being from $10 to $12 per gross ton. Buyers in distant markets who sometimes pick up scrap here are taking no interest. Cast-iron scrap is fairly active at $16 or slightly over per net ton.

E. A. Wilson, president Pacific Coast Steel Company, has purchased 33 acres adjacent to the plant in South San Francisco, and leased 50 acres more, to facilitate expansion to be started shortly.

New York

NEW YORK, Oct. 11, 1916.

Pig Iron.—A strong and confident tone prevails, with prices of foundry grades 50c. to $1 per ton higher in eastern Pennsylvania and at Buffalo. Steel-making iron is also stronger, with low phosphorus $2 to $3 per ton higher for export and small sales of standard made as high as $40 at eastern Pennsylvania furnace, for shipment to domestic consumers. Interest during the week was again centered in large export sales, mainly of steel-making grades for shipment over the remainder of the year and through the first quarter of 1917. Sales made to foreign interests in the New York market aggregated over 100,000 tons for the week, including 20,000 tons of standard Bessemer for export to Great Britain made in the last two days. One sale of 10,000 tons of low phosphorus iron is reported to have been made at $37 per ton at furnace and another lot of 10,000 tons is under negotiation for shipment to Italy. One Alabama furnace interest is reported to have sold an additional lot of 50,000 tons of basic at $15, Birmingham basis, for export to France. Neutral European countries have taken about 20,000 tons more of foundry grades, including 10,000 tons for the Netherlands and a number of smaller lots, aggregating 10,000 tons, for shipment to Scandinavian countries, to Greece and to Switzerland. Several other unsatisfied inquiries are still in the market for export, including 3000 tons of low-phosphorus iron for Japan. Domestic consumers have bought a little less freely of foundry grades, but sales aggregating about 20,000 tons have come to the surface, made up mainly of small lots ranging from a few hundred to 1500 tons each for shipment over the rest of this year and the first half of 1917. One manufacturer of soil pipe is reported to have closed a contract for about 5000 tons of foundry iron, including some Virginia metal, for shipment to a plant near Baltimore. This same interest has also taken 1500 tons of foundry iron for shipment to Newark, N. J. Several eastern Pennsylvania furnaces emphasize the effect of higher productive cost by advancing prices over $1 per ton, with some sales made at the higher level. We quote at tidewater for early delivery: No. 1 foundry, $21 to $22; No. 2 X, $20.50 to $21.50; No. 2 plain, $20 to $20.50; Southern iron at tidewater, $20.25 to $20.75 for No. 1 and $20 to $20.25 for No. 2 foundry and No. 2 soft.

Ferroalloys.—Speculation as to the possible effect of nearby submarine warfare on imports of ferromanganese, as well as manganese ore, is demanding some attention, but thus far no excitement has resulted. Inquiries are few and sales the past week have not exceeded 1000 tons. This has been principally domestic alloy, which has gone at $165, delivered, and this is now regarded as the firm quotation. A small tonnage was sold at $160, delivered, but this was made partly from Cuban manganese ore and the sale involves special features. The quotation for British ferromanganese is $164, seaboard, for any delivery. Spiegeleisen is quiet at $40 to $45, furnace. Ferrosilicon, 50 per cent, is very active, and the filling of specifications on contracts is difficult. Inquiries are more numerous, especially for next year's delivery, and it is not unlikely that the quotation will be advanced to $100, Pittsburgh.

Structural Material.—A more active demand is being experienced for plain structural shapes on the basis of 2.75c.. Pittsburgh mill, and in some instances slightly higher prices have been asked and paid for shipment over three to six months. The fabricating shops are taking more orders in the Eastern territory on the basis of 2.70c. to 2.80c. for plain material. The rail-

roads are placing more contracts for bridges and larger contracts are assured in the near future. The Cincinnati, Hamilton & Dayton has divided a contract for 800 tons of bridge work between the Fort Pitt Bridge Company and the Toledo Bridge & Crane Company, 700 tons of the total going to the former company. The Chicago Northwestern has given an order for 1076 tons for ore spouts to be installed on dock No. 3 at Ashland, Wis., to the American Bridge Company. The Chicago, Burlington & Quincy has asked for tenders on 5000 tons for terminal work at Chicago; the Chicago & Alton is to build a freight shed at Chicago requiring from 2000 to 3000 tons. The Pennsylvania railroad has come into the market for 1500 tons of bridge work and the Baltimore & Ohio asks tenders on 500 tons for 13 spans. The Southern Railway, for repair shops to be constructed at Spencer, N. C., will require 500 tons of shapes. The Seaboard Air Line is expected to make an award on several hundred tons of steel for car shops at Savannah, bids for which were recently submitted. Steel building work is more animated. Among the most recent contracts closed are the following: 250 tons for an extension to the South Ferry building, awarded to the Passaic Structural Steel Company; 350 tons for the Jewish Center on Eighty-sixth Street, to the Hinkle Iron Works; 500 tons for the Baker & Williams warehouse, South Morton Street, to the Levering & Garrigues Company; 800 tons for the Joseph Paterno apartment on 104th Street and West End Avenue, to the Passaic Steel Company, and 350 tons for a loft building at 39th Street and Seventh Avenue to the George A. Just Company. The Aluminum Company of America has placed 276 tons for plant extension with the McClintic-Marshall Company; the Pullman Company has awarded a contract for 1200 tons of steel for a building at Pullman, Ill., to the Kenwood Bridge Company. The Adams Express Company is about to take bids on 1500 tons of steel for a building at Chicago. Tenders went in yesterday on 1200 tons of steel for a loft building at 43 West Thirty-sixth Street, New York City, for the Nameloc Company. Bids have been asked on 800 tons of steel for the Union Square Building. A station for the Central Railroad of New Jersey at Newark will require 1200 tons. We quote mill shipments of plain structural material at 2.769c. to 3.019c., New York, 2.869c. minimum for largest lots for fair delivery, and warehouse shipments at 3.35c., New York.

Steel Plates.—Shipyards are overwhelmed with inquiries for boats from foreign and domestic interests. Norwegian companies are most importunate. Builders on the Atlantic coast report active inquiries for 50 ships, and each day adds to the number for which prices are asked. In turn, the steel mills are being pressed for plates and shapes for boat construction. One contract for 15,000 tons of plates is on the point of being closed with an Eastern mill by a domestic builder. Other inquiries are in the market from shipyards on the Pacific and Atlantic coasts, aggregating about 40,000 tons. Export inquiries are in larger volume. Great Britain is asking for prices on 43,000 tons of plates, shapes, blooms and billets, the largest single item being 25,000 tons of plates. Japan has placed an order for 5000 tons of ship plates at 5c. base mill, for relatively early shipment, and has put out another inquiry for 6800 tons. Italian interests are still in the market for 15,000 tons of plates. The Victorian government, Australia, is asking for prices on 4000 tons of ship plates and there are numerous other small inquiries ranging from 2000 to 5000 tons each from other countries. Wide plates are difficult to buy before the third quarter of 1917, and command 4c., Pittsburgh. Plates up to 7 ft. in width likewise take 4c., but deliveries may be made in 6 to 8 weeks, while universal plates are not in good demand and may be obtained in a few weeks and at 3.50c., Pittsburgh. Warehouse prices range from 4c. to 4.50c., New York.

Iron and Steel Bars.—Automobile manufacturers are actively in the market for bars for the first half of 1917, including various lots of 15,000, 8000, 6000 and 3000 tons. The aggregate is fully 50,000 tons. Most of the inquiries come from Detroit to Eastern mills. Agricultural implement manufacturers are also in the market for supplementary lots of soft steel bars in lots of 2000 to 6000 tons each for shipment over the first half of next year. Independent mills are making sales at 2.70c. to 2.75c. base, and small lots are sold at 3c. to 3¼c. per lb. Among the foreign inquiries is one lot of 12,000 tons hard steel bars and it is understood that a portion of this contract has been placed. Iron bars are strong at 2.669c. and 3.25c., New York, respectively, for mill and warehouse shipments. Steel bars are 3.25c. to 3.50c. from store, New York.

Cast-Iron Pipe.—Nothing of importance has transpired in municipal lettings, which are, of course, far apart at this season. Private buying keeps up quite well, with inquiries and some negotiations for next pear's delivery. Prices are firm, with an inclination to advance. Carload lots of 6-in., class B and heavier, are held at $31.50 per net ton, with $1 per ton extra for class A and gas pipe.

Old Material.—The market is gradually growing better, both as to sales and prices. The principal demand for heavy melting steel scrap comes from Pittsburgh, and brokers are now paying $14.25 to $14.50 for shipment to that locality. While embargoes have been lifted in eastern Pennsylvania, the steel companies there appear to be well covered and are not making new contracts, but shipments are still due on old contracts, to cover which the dealers are buying. The iron rolling mills are quite active in the market, as they have been for some weeks, and all kinds of rolling-mill stock are stronger. Machine-shop turnings and mixed borings and turnings are being bought quite freely by owners of blast furnaces in eastern Pennsylvania. Brokers quote buying prices for the Eastern trade about as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap (eastern Pennsylvania specifications)	$12.75 to $13.25
Old steel rails (short lengths) or equivalent	14.00 to 14.25
Relaying rails	28.50 to 29.00
Rerolling rails	17.50 to 18.00
Iron and steel car axles (for export)	38.50 to 39.00
No. 1 railroad wrought	19.75 to 20.00
Wrought-iron track scrap	16.75 to 17.00
No. 1 yard wrought, long	14.50 to 15.00
Light iron (nominal)	3.50 to 4.00
Cast borings (clean)	7.50 to 8.00
Machine-shop turnings (nominal)	5.75 to 6.00
Mixed borings and turnings (nominal)	5.75 to 6.00
Wrought pipe	13.25 to 13.75

Foundries are buying scrap steadily, although not in large quantities. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

No. 1 cast (machinery)	$16.00 to $16.50
No. 2 cast (heavy)	14.00 to 14.50
Stove plate	11.50 to 12.00
Locomotive grate bars	10.00 to 10.50
Old carwheels (nominal)	15.00
Malleable cast (railroad)	12.00 to 12.50

British Steel Market

American Black Sheets Sold at High Price—Tin Plates Declining

LONDON, ENGLAND, Oct. 11, 1916.

(By Cable)

The Cleveland pig-iron market is quiet but strong, and export business is fair. American billets are slow with 2 to 4 in. sizes being offered for November shipment at £14 c.i.f. Liverpool. Tin plates are declining and stock plates are quoted at 32s. 6d. American black sheets, standard specification, have sold at £21, November delivery, c.i.f. Liverpool. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 33s. to 36s.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £20 5s.

Steel ship plates, Scotch, delivered local yards, £13 17s. 6d.

Steel rails, export, f.o.b. works, £10 17s. 6d.

Hematite pig iron, f.o.b. Tees, about 140s.

Sheet bars (Welsh) delivered at works in Swansea Valley, £10 7s. 6d.

Steel bars, export, f.o.b. Clyde, £18.

Ferromanganese (nominal), £35.

Ferrosilicon, 50 per cent, c.i.f., £27.

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery.

	Copper, New York		Tin,	Lead		Spelter	
		Electro-	New	New	St.	New	St.
Oct.	Lake	lytic	York	York	Louis	York	Louis
4	28.50	28.62½	39.75	7.00	6.85	9.75	9.50
5	28.50	28.75	39.75	7.00	6.85	10.17	10.00
7	28.50	28.75	39.75	7.00	6.85	10.17	10.00
8	28.50	28.50	....	7.00	6.85	10.17	10.00
9	28.50	28.50	42.75	7.00	6.85	10.00	9.75
10	28.50	28.50	42.75	7.00	6.85	9.75	9.50

NEW YORK, Oct. 11, 1916.

Copper is quieter but strong. The tin market was highly excited by news of the German submarine activity on this side of the Atlantic and spot advanced to 42.75c. in an active market. Lead is quiet, but firm. Spelter moved up in a flurry of buying late last week, but is now quieter and easier. Antimony is higher following buying of metal in bond.

New York

Copper.—The market is by no means devoid of inquiry, especially for delivery next year, but as compared with previous weeks it is much quieter. Spot electrolytic is quoted at 29c., November at 28.50c., December at 28c., January at 27.50c., and first quarter at 27.25c. A manufacturing company was offered first quarter at 27c., last week, but on the following day, when it attempted to place an order, the sellers balked and asked 27.25c. It is intimated, however, that a large quantity might be had at 27c. for first quarter. The market is getting back to a more normal basis, although the producers and sellers are so heavily booked that they are extremely independent. Lake was sold on Monday at 27.12½c. for second quarter delivery. Its nearby positions are nominally at par with electrolytic. The prices for brass products are nominally unchanged, although the mills are a month or more further behind in shipments than they were two weeks ago, and where they quote on deliveries to be made in 2 or 3 months they exact premiums of 1c. to 2c. The London market for spot electrolytic was quoted yesterday at £142, or £2 higher than a week previous. The exports this month, including yesterday, total 7125 tons. Exports of brass in bars, plates, etc., in seven months of this year totaled 51,372 tons, compared with 18,089 tons in the same period of 1915.

Tin.—On Monday, when the trade received news of the German submarine activity, the tin market became greatly excited and the spot price advanced to 42.75c. A good business was done, mostly for futures, November and December deliveries selling around 40.75c. to 41c. Banca was active at 39.75c. to 39.87½c. Probably 500 tons changed hands during the day. Last Wednesday and Thursday the market appeared quiet on the surface, but it leaked out that a good business was being done quietly, probably 500 tons changing hands on the two days, mostly shipments from the East at a price close to 39.75c. Banca tin, December arrival, sold on the two days at about 38.75c., a fact regarded as interesting because it means a resumption of Banca shipments from the East. Yesterday the market was quieter, but firm, although spot Banca was taken at 41.60c. The London market for spot Straits advanced yesterday to £181 from £178 2s. 6d. The arrivals of the month total 1015 tons, and there is afloat 2245 tons.

Spelter.—Last Thursday a heavy business was done, and the price for prompt and October deliveries mounted to 10c., St. Louis, and 10.17c. and upward, New York. Much of the buying was on the part of the producers and sellers themselves, for just what reason appears uncertain. The activity on Thursday was so great that the day was described as a wild one. Friday brought a quieter market, and on Monday the sellers were looking for business. The activities of the German U-boat appeared to have a quieting effect on the metal. Prime Western was quoted yesterday at 9.75c., New York, and 9.50c., St. Louis; November at 9.62½c., St. Louis; fourth quarter at 9.62½c., St. Louis, and first quarter at 9.50c., St. Louis. The demand for brass-mill special is impaired by the large quantity of high-grade scrap available. The minimum is about 10.75c., St. Louis. The exports this month, including yesterday, total 3032 tons. The spot price at London yesterday was £56, against £52 a week previous.

Lead.—Since the last report the market has been quiet but steady. Sellers have not been anxious to sell, nor have consumers shown any desire to buy. Less talk is heard of higher prices, despite the fact that production and consumption keep about even. The leading interest adheres to 7c., New York, and 6.92½c., St. Louis, with independents quoting from 7c. to 7.12½c., New York, and 6.85c. to 6.90c., St. Louis, for prompt deliveries. The exports this month, including yesterday, total 1882 tons. The London quotation for spot yesterday was £30 15s., against £31 15s. a week ago.

Antimony.—Prompt metal has been taken at 10.50c., but the market is stronger at 11.50c., duty paid. The better tone is due to considerable activity in lots in bond at around 10.50c.

Aluminum.—The market is more active and the quotation for No. 1 virgin, 98 to 99 per cent pure, has advanced to 65c. to 67c.

Old Metals.—The market continues strong. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible	26.75 to 27.25
Copper, heavy and wire	25.00 to 26.00
Copper, light and bottoms	22.50 to 23.00
Brass, heavy	15.00 to 15.50
Brass, light	12.00 to 12.50
Heavy machine composition	20.50 to 21.50
No. 1 yellow rod brass turnings	15.00 to 15.50
No. 1 red brass or composition turnings	16.00 to 17.00
Lead, heavy	6.50
Lead, tea	6.00
Zinc	7.00 to 7.50

Chicago

OCT. 9.—The heavy sales of copper already consummated, with further large buying in prospect, has set up a very strong market. Spelter is higher, but the lead market remains quiet. Tin quotations are much affected by the submarine situation, and prices shot up in spectacular fashion. Scrap metals show sharp advances. We quote: Casting copper, 27.50c.; Lake copper, 28.50c. to 29c.; tin, carloads, 45c. and small lots, 45c.; lead, 6.90c. to 6.95c.; spelter, 9.87½c. to 10c.; sheet zinc, 15c.; Cookson's antimony, 50c.; other grades, 13c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 24c.; copper bottoms, 22c.; copper clips, 23c.; red brass, 20c.; yellow brass, 16c.; lead pipe, 6c.; zinc, 8c.; pewter, No. 1, 25c.; tinfoil, 30c.; block tin pipe, 37c.

St. Louis

OCT. 9.—Metals have been quiet but with prices firmly held. The closing quotations today were: Lead, 6.85c. to 6.95c.; spelter, 10c.; tin, 45c.; Lake copper, 29c.; electrolytic copper, 28.75c.; antimony, Asiatic, 15c. In the Joplin ore market zinc blende showed an advance on the top grades of $2.50 per ton, while on the lower grades advances in some instances were as high as $10. The average for the week throughout the district was $58. Calamine averaged $38. Lead ore averaged $68. We quote dealers' buying prices for miscellaneous scrap metals as follows: Light brass, 8c. to 8.50c.; heavy yellow brass, 11.50c. to 12c.; heavy red brass and light copper, 15.50c. to 16c.; heavy copper and copper wire, 18.50c. to 19c.; zinc, 5.75c. to 6c.; lead, 5c.; tea lead, 3.50c.; pewter, 25c.; tinfoil, 31c.

The Berlin Federation for Import Trade, founded some months ago in collaboration with the Berlin Chamber of Commerce, is reported to have formed a special group for metals and metalliferous ores. Thirty-one firms constitute the membership, including the leading electrical, wire-making, engineering and metal-dealing firms. The president is Herr Deutsch of the Allgemeine Elektrizitäts Gesellschaft and the vice-presidents are Herr Levy of N. Levy & Co., and Herr Warning of the Metallgesellschaft in Frankfurt.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c. Denver, pipe, 76.1c., minimum carload 46,000 lb.; structural steel and steel bars, 83.6c., minimum carload 36,000 lb. Pacific coast (by rail only), pipe, 65c.; structural steel and steel bars, 75c., minimum carload 50,000 lb.; structural steel and steel bars, 80c., minimum carload 40,000 lb. No freight rates are being published via the Panama Canal, as the boats are being used in transatlantic trade.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees 3 in. and over, 2.60c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Handrail tees	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft	1.55

No charge for cutting to lengths 3 ft. and over.

Plates.—Tank plates, ¼ in. thick, 6 in. up to 100 in. wide, 3.50c. to 4c., base, net cash, 30 days, or ½ of 1 per cent discount in 10 days, carload lots. Extras are:

Quality Extras

	Cents per lb.
Tank steel	Base
Pressing steel (not flange steel for boilers)	.10
Boiler and flange steel plates	.15
"A. B. M. A." and ordinary firebox steel plates	.20
Still bottom steel	.30
Locomotive firebox steel	.50

Marine steel, special extras and prices on application.

Gage Extras

Rectangular, ¼ in. thick, over 6 in. wide to 100 in. wide	Base
Lighter than ¼ in., to 3/16 in., up to 72 in. wide	.10
*Lighter than ¼ in., including 3/16 in., over 72 in. to 84	.20
*Lighter than ¼ in., including 3/16 in., over 84 in. to 96	.30
*Lighter than ¼ in., including 3/16 in., over 96 in. to 100	.40
*Lighter than ¼ in., including 3/16 in., over 100 in. to 102	.45
Lighter than 3/16 in., including No. 8, up to 72 in. wide	.15
*Lighter than 3/16 in., including No. 8, over 72 in. to 84	.25
*Lighter than 3/16 in., including No. 8, over 84 in. to 96	.35
Lighter than No. 8, including No. 10, up to 60 in. wide	.30
Lighter than No. 8, including No. 10, over 60 in. to 64	.35

Up to 72 in. and not less than 10.2 lb. per sq. ft. will be considered ¼ in.
Over 72 in. must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft. to take base price.
Over 72 in. wide, ordered less than 11 lb. per sq. ft., down to weight of 3/16 in., take price of 3/16 in.
Over 72 in., ordered weight 3/16 in., take No. 8 price.
Over 72 in., ordered weight No. 8, take No. 10 price.

Width Extras

Over 100 in. to 110 in. inclusive	.05
Over 110 in. to 115 in. inclusive	.10
Over 115 in. to 120 in. inclusive	.15
Over 120 in. to 125 in. inclusive	.25
Over 125 in. to 130 in. inclusive	.50
Over 130 in.	1.00

Length Extras

Universal plates 80 ft. long up to 90 ft. long	.05
Universal plates 90 ft. long up to 100 ft. long	.10
Universal plates 100 ft. long up to 110 ft. long	.20

Cutting Extras

No charge for rectangular plates to lengths 3 ft. and over.

Lengths under 3 ft. to 2 ft. inclusive	.25
Lengths under 2 ft. to 1 ft. inclusive	.50
Lengths under 1 ft	1.55
Circles 3 ft. in diameter to 100 in.	.30
Circles over 100 to 110 in. (width extra)	.35
Circles over 110 to 115 in. (width extra)	.40
Circles over 115 to 120 in. (width extra)	.45
Circles over 120 to 125 in. (width extra)	.55
Circles over 125 to 130 in. (width extra)	.80
Circles over 130 in. (width extra)	1.30
Circles under 3 ft., to 2 ft., inclusive	.55
Circles under 2 ft., to 1 ft., inclusive	.80
Circles under 1 ft	1.85

Half circles take circle extras.
Sketches not over four straight cuts, inc. straight taper .10
Sketches having more than four straight cuts .20
Plates sheared to a radius take complete circle extras.

*Including extra for width.

Wire Rods.—Including chain rods, $55 to $60.

Wire Products.—Prices to jobbers effective Aug. 5: Fence wire Nos. 6 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, $2.55; galvanized, $3.25. Galvanized barb wire and staples, $3.45; painted, $2.75. Wire nails, $2.60. Galvanized nails, 1 in. and longer, $2 advance over base price; shorter than 1 in., $2.50 advance over base price. Cement-coated nails, $2.50. Woven wire fencing, 60 per cent off list for carloads, 59 off for 1000-rod lots, 58 off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	6 to 9	10	11	12&12½	13	14	15	16
Annealed	$2.60	$2.65	$2.70	$2.75	$2.85	$2.95	$3.05	$3.15
Galvanized	3.30	3.35	3.40	3.45	3.55	3.65	4.10	4.20

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect on black pipe from Sept. 7, 1916, and on galvanized pipe from July 24, 1916, all full weight:

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛, ¼ and ⅜	62	35½	⅛ and ¼	51	24
½	66	51½	⅜	52	25
¾ to 3	69	55½	½	56	38
			¾ to 1½	59	43

Lap Weld

2	63	50½	1¼	46	31
2½ to 6	66	53½	1½	52	38
7 to 12	63	49½	2	53	39
13 and 14	63½	..	2½ to 4	55	42
15	51	..	4½ to 6	55	42
			7 to 12	54	41

Reamed and Drifted

1 to 3, butt	67	53½	¾ to 1½, butt	54	37
2, lap	61	48½	1¼, lap	41	25
2½ to 6, lap	64	51½	1½, lap	47	32
			2, lap	48	33
			2½ to 4, lap	51	36

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	58	40½	⅛, ¼ and ⅜	51	34
½	63	50½	½	56	43
¾ to 1½	67	54½	¾ to 1½	60	45
2 to 3	68	55½			

Lap Weld, extra strong, plain ends

2	61	49½	1¼	48	33
2½ to 4	64	52½	1½	53	39
4½ to 6	63	51½	2	55	42
7 to 8	59	45½	2½ to 4	57	45
9 to 12	54	40½	4½ to 6	56	44
			7 to 8	50	38
			9 to 12	45	33

Butt Weld, double extra strong, plain ends

½	54	43½	½	43	31
¾ to 1½	57	46½	¾ to 1½	46	34
2 to 2½	59	48½			

Lap Weld, double extra strong, plain ends

2	53	43½	1¼	42	30
2½ to 4	55	45½	2	42	30
4½ to 6	54	44½	2½ to 4	44	35
7 to 8	49	35½	4½ to 6	43	34

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts on less than carloads, freight to destination added, effective from Sept. 7, 1916, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1½ in.	33	1½ in.	25
1¾ and 2 in.	45	1¾ and 2 in.	37
2¼ in.	42	2¼ in.	34
2½ and 2¾ in.	48	2½ and 2¾ in.	40
3 and 3¼ in.	53	3 and 3¼ in.	45
3½ to 4½ in.	54	3½ to 4½ in.	46
5 and 6 in.	47	5 and 6 in.	39
7 to 13 in.	44	7 to 13 in.	36

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipments on sheets of U. S. standard gage, in carload and larger lots, are as follows, 30 days net, or 2 per cent discount in 10 days:

Box Annealed Sheets, Cold Rolled

	Cents per lb.
Nos. 17 to 21	2.90 to 3.05
Nos. 22 and 24	2.95 to 3.10
Nos. 25 and 26	3.00 to 3.15
No. 27	3.05 to 3.20
No. 28	3.10 to 3.25
No. 29	3.15 to 3.30
No. 30	3.35 to 3.50

Galvanized Sheets of Black Sheet Gage

Nos. 10 and 11	3.25 to 3.40
No. 12	3.35 to 3.50
Nos. 13 and 14	3.35 to 3.50
Nos. 15 and 16	3.50 to 3.65
Nos. 17 to 21	3.65 to 3.80
Nos. 22 and 24	3.80 to 3.95
Nos. 25 and 26	3.95 to 4.10
No. 27	4.10 to 4.25
No. 28	4.25 to 4.40
No. 29	4.40 to 4.55
No. 30	4.65 to 4.80

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	2.95 to 3.05
Nos. 9 and 10	3.00 to 3.10
Nos. 11 and 12	3.05 to 3.15
Nos. 13 and 14	3.10 to 3.20
Nos. 15 and 16	3.20 to 3.30

Judicial Decisions

ABSTRACTED BY A. L. H. STREET

FORMATION OF BINDING CONTRACTS.—Although an order for machinery taken by a traveling salesman subject to approval by his employer does not constitute a binding contract until such approval has been expressed, that may be done by the mere shipment of the machinery, without other notice to the buyer. When a seller, in accepting an order, attaches a new condition, such as a condition that title shall remain in him until payment of the purchase price, there is no binding contract until the buyer signifies his acceptance of the condition. (Alabama Supreme Court, Sturdivant vs. Mount Dixie Sanitarium, Land & Investment Company, 72 Southern Reporter, 502.)

ACCEPTANCE OF DELIVERY BY BUYER.—Under the general rule that the buyer under a single contract cannot accept part of the goods contracted for and reject the remainder, where there was an agreement for a sale of two freezing machines, the buyer was entitled to reject the whole apparatus on part of it proving deficient, but he had no right to accept part of the machinery and reject the remainder. The buyer's right to inspect and approve goods delivered before being deemed to have accepted them, when such right is reserved without mention of the time within which it is to be exercised, must be exercised within a reasonable time. Failure to reject delivery within a reasonable time is equivalent to an acceptance. So, in this case, the buyer's continued use for several months of part of the apparatus delivered to him amounted to an acceptance of the whole equipment, although part of it proved unsatisfactory and was not used. (Connecticut Supreme Court of Errors, Emery Thompson Machine & Supply Company vs. Graves, 98 Atlantic Reporter, 331.)

BREACH OF CONTRACTS FOR SALE OF MINERAL PRODUCTS.—A company which contracted to sell its output of zinc concentrates was not justified in terminating the contract merely because the buyer failed to make a small payment when due, if the buyer had customarily made payments when convenient, and especially if the seller first announced an intention to break the contract, carrying with such breach a claim for substantial damages in favor of the buyer. When, under such a contract, the buyer is unable to obtain a substitute quantity of the same kind of ore elsewhere, his recoverable damages are to be ascertained with reference to the market value of the best available substitute. (United States Circuit Court of Appeals, Second Circuit, Tri-Bullion Smelting & Development Company vs. Jacobsen, 233 Federal Reporter, 646.)

German Steel Works Union on Trade Conditions

At the regular meeting of the German Steel Works Union, on Aug. 31, a report was authorized which stated that the domestic demand for semi-finished steel continued good, so that, in spite of no exports, considerable difficulty was experienced in meeting it. Fourth quarter orders were accepted at unchanged prices and conditions. In railroad material the Prussian State Railways had placed a supplementary order for small accessories. The Wurttemberg State Railways' orders for the current financial year are equal to those of last year. Mine rail demand is urgent, with the specifications for grooved rails equal to those of the last few months. Orders from neutral countries have been few. In shapes there is no change, but demand from neutral countries continues active. To meet domestic requirements export sales have been restricted and no new contracts accepted.

The Rhenish-Westphalian coal mines have recently experienced trouble in getting mine rails so that the German Steel Syndicate has approached the Mining Union at Essen suggesting that the union ascertain from the collieries their approximate requirements for the next half year and undertake the distribution of the supplies.

Iron and Industrial Stocks

NEW YORK, Oct. 11, 1916.

The orderly movement of the stock market was rudely interrupted by the exploit of a German submarine on Sunday last in sinking a number of British and neutral ships not far from Nantucket Island. A violent break was precipitated on Monday when the stock market opened and all of the recent active stocks suffered heavily. A conspicuous instance was Republic common, which had sold up to 82 on the preceding Monday and had closed on Saturday at 76, but fell to a low of 60 on Monday, from which it recovered to 77. As the developments on Monday appeared to indicate that this country was not likely to be involved in any complications the market steadied and closed with a good gain from the bottom, which was maintained on Tuesday, but the level of prices obtained on Saturday was not reached. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	24⅛ - 27½	Pressed Stl., com.	60 - 69
Allis-Chal., pref.	79¼ - 81⅝	Pressed Stl., pref.	104 -105
Am. Can, com.	56 - 66⅛	Ry. Steel Spring, com.	51⅝ - 57¾
Am. Can, pref.	114 -115	Ry. Steel Spring, pref.	101⅞ -102⅛
Am. Car & Fdy., com.	65 - 72¼	Republic, com.	60 - 82
Am. Car & Fdy., pref.	117	Republic, pref.	110 -112⅝
Am. Steel Fdries.	58 - 65½	Sloss, com.	55⅛ - 66⅛
Bald. Loco., com.	79½ - 92¼	Sloss, pref.	96 - 98½
Bald. Loco., pref.	108½	Pipe, com.	22½ - 26⅞
Beth. Steel, com.	535 -559	Pipe, pref.	56⅞
Beth. Steel, pref.	135	U. S. Steel, com.	108 -118¾
Case (J.I.), pref.	83 - 83⅝	U. S. Steel, pref.	119 -121¼
Colorado Fuel	48¾ - 61	Va. I. C. & Coke.	42 - 47½
Am. Loco., com.	75 - 84	Westing. Elec.	59½ - 67¼
Am. Loco., pref.	106 -107	Am. Rad., com.	400 -400½
Deere & Co., pref.	94½ - 95	Am. Ship, com.	52½ - 55
Gen. Elec.	175½ -183	Am. Ship, pref.	94⅝ - 95
Gt. No. Ore Cert.	41 - 45⅝	Chic. Pneu. Tool	72 - 74½
Int. Harv. of N. J., com.	116 -121	Cambria Steel	80 - 95
Int. Harv. of N. J., pref.	120 -122	Lake Sup. Corp.	11½ - 14½
Int. Harv. Corp., com.	78 - 79	Warwick	9⅝ - 9⅞
Int. Harv. Corp., pref.	110	Cruc. Steel, com.	83½ - 95⅝
Lacka. Steel	82 - 88⅝	Cruc. Steel, pref.	121 -122
Nat. En. & Stm., com.	25½ - 30	Harb.-Walk. Refrac., com.	115
Nat. En. & Stm., pref.	95 - 96	Harb.-Walk. Refrac., pref.	106½
N. Y. Air Brake.	153½ -162¾	La Belle Iron, com.	74½ - 80
Pitts. Steel, pref.	104 -106	Carbon Stl., com.	92 - 95
		Driggs-Seabury	88½ - 90
		Midvale Steel	66 - 75½

Dividends

The Westinghouse Air Brake Company, extra 10 per cent, or $5 a share, payable Nov. 21.

The Harbison-Walker Refractories Company, regular quarterly, 1½ per cent on the preferred stock, payable Oct. 20.

The American Shipbuilding Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 14.

The Atlantic Steel Company, quarterly, 1½ per cent on the common stock, payable Oct. 10.

The Chalmers Motor Company, regular quarterly, 1¾ per cent on the preferred stock and 2½ per cent on the common stock, paid Oct. 1.

The Charcoal Iron Company of America, initial dividend on the preferred stock, 1 per cent payable Nov. 1, 1 per cent payable Dec. 1 and 1 per cent payable Jan. 2.

The American Laundry Machinery Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 14.

The Canadian Westinghouse Company, Ltd., regular quarterly, 1¾ per cent, payable Oct. 10.

The General Motors Company, regular quarterly, 5 per cent on the common stock and 3½ per cent on the preferred stock, payable Nov. 1.

The National Enameling & Stamping Company, regular quarterly, 1¾ per cent on the preferred stock, paid Sept. 30.

The United States Cast Iron Pipe & Foundry Company, regular quarterly, 1½ per cent on the preferred stock, payable Nov. 15.

Record Imports of Manganese Ore in July

Manganese ore imports into the United States in July were 81,942 gross tons, the largest this year. The total for the seven months to Aug. 1, 1916, is 318,965 tons, against only 87,136 tons to Aug. 1, 1915, and 163,390 tons to Aug. 1, 1914. The rate for this year is 45,566 tons per month, which contrasts with 28,757 tons per month in 1913, the best previous record, and 22,470 tons per month as the average for the five-year period of 1910 to 1914.

PERSONAL

Marvin A. Neeland, assistant to vice-president, and chief engineer of the United States Steel Corporation, has resigned to accept the position of consulting engineer of the American International Corporation, with headquarters at 120 Broadway, New York. John Hulst, chief engineer of the Carnegie Steel Company, has been appointed to succeed him.

Mr. Neeland joined the corporation in 1905. He was then general manager of the William Tod Company, Youngstown, Ohio. He has, however, been actively connected with the steel business for some 24 years, having been chief engineer of the Duquesne works of the Carnegie Steel Company from 1892 to 1898; chief engineer of what was then the Ohio Steel Company, Youngstown, from 1898 to 1900, and chief engineer of the National Steel Company, Youngstown, from 1900 to 1901, when he became identified with the William Tod Company. He is perhaps best known as the originator of the Neeland top for blast furnaces. This was developed when as chief engineer of the Carnegie Duquesne works he designed the Duquesne blast-furnace plant, which represents the first modern furnace plant equipped mechanically throughout with the automatic filling of the furnace and the automatic and mechanical handling of ore and other materials in the stock yard. The blast furnace plant built when he was chief engineer of the Ohio Steel Company marked a further step in the mechanical handling of materials through the use of a car dumper for handling ore in connection with ore bridges. He was chief engineer of the National Steel Company when the Mingo Junction blast furnaces were designed. He was identified with the committee on the construction of the Gary and Duluth plants of the Steel Corporation and was a member of the committee on construction of the new plant at Ojibway, Ontario.

Mr. Hulst, prior to becoming chief engineer of the Carnegie Steel Company, when he succeeded E. E. Slick on the latter's becoming general manager of the Cambria Steel Company, was chief engineer of the Ohio steel works of the United States Steel Corporation.

R. A. Bull, widely known as president of the American Foundrymen's Association, and for more than ten years past associated with the Commonwealth Steel Company, Granite City, Ill., has resigned as manager of production for that company, effective Nov. 1.

Henry Ford, the famous Detroit automobile builder, visited last week the Edgar Thomson blast furnaces of the Carnegie Steel Company at Bessemer, Pa., and then spent several days in Youngstown, Ohio, with Julian Kennedy, consulting engineer, Pittsburgh, and others, making an inspection of the blast furnaces, steel works and finishing mills of the Youngstown Sheet & Tube Company. As announced some time ago, Mr. Ford contemplates the building of two large blast furnaces near Detroit, Mich., for which Mr. Kennedy is consulting engineer. It is planned to connect the furnaces with the Ford foundry, so that it will be possible to keep the iron in a molten state from the time it leaves the furnace tap hole until it is poured into the foundry molds.

Robert Bentley, president Ohio Iron & Steel Company, on his return from a sojourn in the Adirondacks, announces that plans have been made to rebuild the Mary furnace at Lowellville, Ohio. All material for the rebuilding has been delivered. It is planned to erect a temporary shell stack, which will permit operations while the new work is going on. The capacity in the remodeling is to be increased 25 per cent.

Ralph G. Farrell has been appointed vice-president and general manager of the Bridgeport Screw Company, Bridgeport, Conn., effective as of Oct. 1. W. H. Farrell, his father, has resigned the position of general manager, but still retains an active interest in the business as president. Ralph G. Farrell is a 1914 graduate of Sheffield Scientific School, Yale University. He has since been connected with the Carnegie Steel Company's works at Youngstown, American Steel & Wire Company's Worcester plant, and as assistant manager of the United States Steel Products Company. He is a nephew of James A. Farrell, president United States Steel Corporation.

Byron C. Hamilton has resigned as assistant superintendent of the structural department of the Cambria Steel Company, Johnstown, Pa., to become works manager of the National Steel Car Company, Hamilton, Canada. He has been identified with the Cambria Company about 20 years.

Otis C. Friend, who resigned from the Mitchell Motors Company, Racine, Wis., two months ago to become vice-president and general manager of the United Motors Corporation, has returned to the Mitchell Company, succeeding H. L. McClaren as president and general manager. John W. Bate remains vice-president, in charge of manufacturing, and chief engineer; W. H. Armstrong, secretary and treasurer, and F. L. Mitchell, comptroller.

Frank L. Eidmann has resigned as efficiency engineer with the American La France Fire Engine Company, Elmira, N. Y., to accept a position with the Heald Machine Company, Worcester, Mass.

Harry Kaplan has joined the Winchester Repeating Arms Company, New Haven, Conn., as efficiency engineer.

Barton Cruikshank, recently associated with the Ashcroft Mfg. Co., Bridgeport, Conn., is now New York manager of the C. G. Garrigus Machine Company.

Elmer E. Gibson has been made superintendent of the Ashcroft Mfg. Co., Bridgeport, Conn.

Cecil Reilly, son of W. C. Reilly, general superintendent of the mills of the Youngstown Sheet & Tube Company, has accepted a position with the Colorado Fuel & Iron Company.

A. Walter Lorenz has been made chief chemist for the Bucyrus Company, South Milwaukee, Wis. He was formerly chemist for the Lebanon Steel Foundry, Lebanon, Pa.

John Comstock has been made assistant superintendent of the blast-furnace department at the Steelton plant of the Bethlehem Steel Company.

B. D. Gray was elected to succeed F. E. Bright as president of the Hess-Bright Manufacturing Company, Philadelphia, at a meeting of the directors of the company, Oct. 6. Mr. Bright remains chairman of the board. Mr. Gray was formerly manager of the company.

Leo C. Steinle, recently of New York City, is now in England, where he will open an office for handling sales of machine tools in Great Britain and France. He will represent the Steinle Turret Machine Company, Modern Tool Company and other tool builders.

The Chain Belt Company, Milwaukee, Wis., has appointed C. F. Messinger manager of its concrete mixer department. He is a graduate of the Sheffield Scientific School of Yale University and has for years managed the advertising department. He will take charge at once, and will augment the service feature which has always accompanied Chain Belt mixers.

O. W. Cook has been promoted from manager of works to manager of the Canadian Cartridge Company, Ltd., Hamilton, Ont.

H. M. Hawkesworth, manager of the Sharon, Pa., works of the Driggs-Seabury Ordnance Company for the past year, has resigned on account of ill health. A. B. Davenport will fill the position. S. E. Gross, purchasing agent, has resigned and will be succeeded by M. H. Carter.

Burt B. Brewster, for the past two years manager in Alaska for the Sullivan Machinery Company, Chicago, has been transferred to Salt Lake City, Kearns Building, as manager of the company's branch office

there, succeeding H. E. Moon, resigned. Walter F. O'Brien, who has for some time been associated with Mr. Brewster, will take his place as local manager for Alaska, with headquarters in the Forrest Building, Juneau.

A cash bonus was offered a few weeks ago to its chemists by the Nova Scotia Steel & Coal Co., Ltd. It was awarded to John Vetter, Sydney Mines, who had to his credit the largest percentage of heats for the past month's specifications.

William H. Tabor, until recently instructor of industrial engineering at Pennsylvania State College, State College, Pa., has been appointed assistant industrial engineer of the tool department of the Winchester Repeating Arms Company, New Haven, Conn.

Emile J. Bayle has been appointed assistant to the president, and production engineer with the Pfaudler Company, Rochester, N. Y.

American Iron and Steel Institute New Members

The following have been elected to membership, subject to the occurrence of vacancies, Oct. 6, 1916:

George E. Dix, sales department, Midvale Steel Company, Philadelphia, Pa.

John M. Garvin, manager and treasurer, Bass Foundry & Machine Company, Rock Run, Ala.

Earl H. Collester, superintendent coke plant, La Belle Iron Works, Steubenville, Ohio.

Laurence D. Weaning, vice-president and general manager, Variety Iron & Steel Works Company, Cleveland, Ohio.

James C. Jones, president and manager, Cleveland Steel Company, Cleveland, Ohio.

Adam R. Demory, vice-president and general manager, Timken Detroit Axle Company, Detroit, Mich.

Henry G. Barnhurst, chief engineer, Fuller Engineering Company, Allentown, Pa.

John H. Schuler, metallurgical engineer, Fuller Engineering Company, Allentown.

John G. Rummel, president Detroit Steel Products Company, Detroit.

Edward F. Goltra, president Mississippi Valley Iron Company, St. Louis, Mo.

Isac B. Merriam, Jr., president and treasurer Chattanooga Boiler & Tank Company, Chattanooga, Tenn.

George A. Sagendorph, treasurer, Penn Metal Company, Boston, Mass.

M. Arthur Tutein, New England sales agent, Thomas Iron Company, Boston.

George I. Stanford, president and general manager, Stanford Steel Products Company, Milford, Conn.

Daniel F. Eschenbrenner, general sales agent, Laclede Steel Company, St. Louis.

Harry J. Steinbreder, vice-president, Laclede Steel Company, St. Louis.

William H. Sommer, vice-president and general superintendent, Keystone Steel & Wire Company, Peoria, Ill.

Harry G. Moore, general sales manager, Keystone Steel & Wire Company, Peoria.

Charles R. Hook, vice-president, American Rolling Mill Company, Middletown, Ohio.

L. L. Helmer, general manager, Cumberland works, N. & G. Taylor Company, Cumberland, Md

Albert T. Keller, chief engineer, Maryland plant, Bethlehem Steel Company, Sparrows Point, Md.

Col. Thomas Cantley, president Nova Scotia Steel & Coal Company, New Glasgow, Nova Scotia, was elected a director of the Institute to fill the vacancy caused by the death of Thomas J. Drummond.

Installations of Heroult Electric Furnaces

Two more Heroult electric steel furnaces have been licensed to operate by the United States Steel Corporation, as follows:

The Carpenter Steel Company, Reading, Pa., will install one 6-ton furnace for making special and alloy steels. This is in addition to the 6-ton furnace announced in THE IRON AGE, April 13, 1916.

The Union Electric Steel Company, Pittsburgh, Pa., will install one 6-ton furnace for making alloy steels. This is a new company recently organized.

These two installations bring the total Heroult furnaces operating or contracted for in the United States and Canada to 78.

OBITUARY

SAMUEL N. TRUMP, president Trump Brothers Machine Company, Wilmington, Del., died Oct. 5 at his home in Silverdale, near Wilmington, aged 81 years. He had been ill about two months. A native of Baltimore, he went to Port Chester, N. Y., where, with his brother, the late C. Newbold Trump, he engaged in the manufacture of machinery. In 1873 the brothers, with Christian Frederick, went to Wilmington where they organized the Trump Brothers Machine Company. On the death of his brother in 1912 Samuel N. Trump became president of the company. For many years he served as president of the old Arnoux Electric Company, Wilmington, which now is a part of the Wilmington & Philadelphia Traction Co. Although he continued as president of the machine company he had taken no active part in the work for several years, living practically a retired life. He was a director of the Wilmington Trust Company, and it was largely through his efforts, while serving as a member of the Board of Education, that the manual training system was introduced in the public schools of the city. He leaves his widow, four sons and two daughters.

FREDERICK DAVIDSON, Pittsburgh, formerly of Beaver Falls, Pa., died from heart failure while bathing in the surf at Atlantic City, N. J., Oct. 5. He was born in Connellsville, Pa., Oct. 29, 1869, and was educated in the public schools of Beaver, Pa., and then attended a military academy in Chester, Pa. He commenced his business career as a bank messenger and later became secretary and treasurer of the Union Drawn Steel Company, Beaver Falls, Pa., holding that position until his health failed about three years ago. He was also president and director of the Beaver Clay Manufacturing Company, a member of the Beaver College board of trustees, secretary and treasurer and a director of the Davidson Coal & Coke Co., vice-president and director of the Davidson Ore Mining Company of Buffalo, a director of the Ingram-Richardson Manufacturing Company of Beaver Falls, a director in the Bank of Pittsburgh, and president of the Monterey Nail Manufacturing Company in Mexico. He was an active patron of sports in Pittsburgh, and was a member of the Union Club. He leaves his widow.

JAMES H. ANTHONY, Providence, R. I., died Oct. 7 from heart trouble, aged 76 years. He was born in Swansea, Mass., entered the employ of the Providence Tool Company in 1865 and became its general superintendent. He made several trips to Turkey at the time when his company was making rifles for the Turkish Government. When the Providence Tool Company became the Household Sewing Machine Company, Mr. Anthony retained his position as general superintendent until 1885. From 1885 to 1893 he was superintendent of the Moore Mfg. & Foundry Co., Milwaukee, Wis. In recent years he had been connected with the Brown & Sharpe Mfg. Co.

Bids for Naval Guns

The Navy Department on Oct 5, opened bids for the forgings for 24 of the 50 14-in. guns with which the new battle cruisers will be armed. A complete set of forgings is estimated to weigh 225,600 lb. There were two competitors, namely, the Bethlehem Steel Company, which bid 35¼c. per pound for the entire allotment and the Midvale Steel & Ordnance Company, which offered to furnish 12 guns only at 35c. per pound. It is understood that the 24 guns will be divided equally between the two companies. The Department has not yet determined when bids will be taken for the remaining 26. The Crucible Steel Company of America was the lowest bidder on 10 sets of 5-in. forgings, at 34.35c. per pound for nickel steel, and 28.75c. per pound for gun steel. When the new munition tax is considered, these figures are virtually the same as those at which contracts for similar forgings were awarded last year.

Our August Exports of Machinery

The following details of United States exports of machinery for August, 1915, and 1916, and for the two eight months' periods ended with those months, have been compiled from the report of the Bureau of Foreign and Domestic Commerce of the Department of Commerce:

	August		Eight Months	
	1915	1916	1915	1916
Adding machines	$45,190	$129,067	$313,720	$956,869
Air-compressing machinery	37,289	131,690	284,889	513,555
Brewers' machinery	1,284	43	53,940	11,325
Cash registers	81,488	299,288	864,884	1,171,109
Parts of	7,748	16,176	70,735	103,710
Cotton gins	10,592	21,922	40,082	61,266
Cream separators	36,079	25,499	192,949	346,362
Elevators and elevator machinery	85,379	180,405	553,511	1,128,769
Electric locomotives	61,739	5,783	195,977	377,042
Gas engines, stationary	18,721	36,783	335,482	248,729
Gasoline engines	450,622	2,032,934	3,532,017	11,256,139
Steam engines	569,859	1,841,236	2,502,972	7,518,864
All other engines	154,881	345,943	712,672	3,454,630
Parts of	431,845	1,235,185	2,795,710	6,311,024
Laundry machinery, power	23,712	41,497	215,945	212,405
All other	23,023	26,804	159,509	146,461
Lawn mowers	16,055	23,412	246,754	170,719
Metal-working machinery (including metal-working tools)	3,624,411	8,134,473	27,587,226	55,316,874
Meters, gas and water	22,936	66,079	180,015	271,071
Milling machinery (flour and grist)	168,133	183,862	1,491,167	1,698,545
Mining machinery, oil well	151,721	316,911	933,570	1,439,620
All other	501,147	750,076	3,425,675	4,269,737
Paper-mill machinery	63,564	108,514	584,196	525,985
Printing presses	85,945	207,375	975,391	1,260,043
Pumps and pumping machinery	324,617	527,970	1,906,309	3,523,658
Refrigerating and ice-making machinery	106,866	64,177	605,602	483,939
Sewing machines	381,192	521,580	4,064,943	3,744,281
Shoe machinery	129,334	82,524	1,000,108	666,450
Sugar-mill machinery	646,120	1,074,104	1,773,126	3,028,172
Textile machinery	183,775	394,224	1,203,499	2,389,367
Typesetting machines	58,043	54,649	294,245	792,551
Typewriting machines	637,023	1,438,199	4,616,295	7,337,443
Windmills	73,066	83,046	564,011	761,794
Wood-working machinery, saw mill	33,209	46,688	245,262	290,715
All other	97,981	125,569	544,374	608,733
All other machinery	2,094,702	4,104,910	14,329,351	25,663,807
Total	$11,439,291	$24,657,597	$79,396,113	$148,061,832

Pittsburgh and Nearby Districts

Former owners of the Burrows Foundry Company, Ellwood City, Pa., and W. H. Christy, formerly superintendent of the Bessemer Foundry Company, Grove City, Pa., and O. B. Dow of the Babcock Lumber Company, Pittsburgh, have incorporated themselves under the name of the Lawrence Foundry Company, which will succeed to the business of the Burrows Foundry Company, manufacturer of high grade gray-iron castings. Equipment is being installed to increase the capacity of the plant from 20 tons to 25 tons a day.

The Wharton Coke Company, whose coke plant is located at Coral, Indiana County, Pa., consisting of 230 ovens and 2500 acres of coal land, has sold its entire holdings to the Potter Coal & Coke Company, a recently organized corporation of which S. F. Potter is president; George P. Donohoe, general manager; Edward E. Donohoe, secretary and treasurer, and C. Rae King, general superintendent.

Rapid progress is being made in the building of the new steel bar and small shape mills of the Carnegie Steel Company at McDonald, between Girard and Niles, Ohio. The American Bridge Company, which has the contract for all the structural work, is now erecting the steel work for the large machine shop. It is the intention of the Carnegie Company to erect nine bar mills in the first installation, and to start them as soon as ready. The order for the mill cranes has been placed with the Morgan Engineering Company, Alliance, Ohio, and within the next month it is expected a large lot of machinery and building material will arrive. William Dennison is superintendent of construction and Fred Hubbard is engineer.

The Penn Central Coal & Coke Company, Pittsburgh, has filed notice at Harrisburg, Pa., of an increase in its debt to $250,000.

The Keystone Tire & Rubber Company, Keystone Building, Pittsburgh, plans to build a new plant at Penn Station, on the Pennsylvania Railroad, about 25 miles from Pittsburgh. The main factory building will be three stories high, 60 x 190 ft., of brick and steel construction.

It is stated that shipments of electrical equipment of the Westinghouse Electric & Mfg. Company, East Pittsburgh, in September made a new high record for any one month in the history of the company, the total amounting very close to 1200 cars. President E. M. Herr has been quoted recently as saying that he expects orders for electrical apparatus after the war is over to increase greatly.

The Brier Hill Steel Company, Youngstown, expects to have its new No. 11 open-hearth furnace in operation about Dec. 1, and the new No. 12 in January. When the entire 12 furnaces are in operation the company will have a daily capacity of close to 1500 tons of open-hearth steel ingots.

C. B. Kelly, for some time connected with the Hubbard, Ohio, works of the American Sintering Company, has been made manager of the new plant being built at Youngstown adjacent to the by-product coke ovens of the Republic Iron & Steel Company. This plant is expected to be ready in November, and will take care of the flue dust from the blast furnaces of the Republic Iron & Steel Company, Mary furnace of the Ohio Iron & Steel Company, the four furnaces of the Youngstown Sheet & Tube Company and one stack of the Struthers Furnace Company.

Blast-furnace operators of the Youngstown district will enter a protest before April 1, 1917, against the change in ore hauling rates as fixed recently by the Interstate Commerce Commission and which imposed on some furnace districts higher rates than previously existed. The old ore hauling rate was 56c. per ton from Ashtabula Harbor to Youngstown, and the new schedule also makes it 56c., but with 6c. additional charge at the docks for loading the ore on cars, and furnace operators are also required to pay for placing cars on the ore trestles at the furnaces.

A large new pumping station is being installed at the Edgar Thomson works of the Carnegie Steel Company at Bessemer, Pa. The work is being done by the T. A. Gillespie Company, Pittsburgh. A system of towers and chutes is used to distribute construction material to all parts of the foundations being built in the Monongahela River. Trouble in securing enough laborers is holding back the completion of the work to some extent.

The Pittsburgh Cold-Rolled Strip Steel Company, which has been located on Twenty-ninth Street, Pittsburgh, has bought a site at Verona, Pa., 10 miles from the city, where it will build a plant which will about double its capacity. The equipment in use will be removed to the new plant, and a new tandem mill, to be

built by the Waterbury-Farrell Foundry & Machine Company, Waterbury, Conn., will be installed. The company expects to have its new plant in operation about Jan. 1.

It is probable that further enlargements will be made to the plant of the Carnegie Steel Company at Farrell, Pa. These enlargements may include large billet and tin bar mills. Definite plans have not yet been made and may not be for some time.

The Pittsburgh Trolley & Forge Company, Pittsburgh, has employed W. E. Moore & Co., engineers, Pittsburgh, to rearrange its forge and machine shops and equip them with an electric plant including individual motor drive, electric welders and other improvements.

The West Virginia Rail Company, Huntington, W. Va., has filed a complaint with the Interstate Commerce Commission against the rate of $2.42 per gross ton on scrap and old rails from Pittsburgh to Huntington. It is urged a rate of $2 would be reasonable, and the commission is asked to order the railroads to establish this rate.

Starting at 6 p. m. Saturday, Oct. 7, and running for a full week, the Youngstown Sheet & Tube Company is conducting a "Safety First Week" at its plants at East Youngstown, Ohio. The object is to see how accidents can be reduced within a given period when everyone about the plants is using his best effort to be careful on the theory that many accidents could be prevented if the men were careful at all times. The test is being made under the direction of J. M. Woltz, safety director of the company. Prizes are to be given to foremen who can report no accidents in their department during the week.

The first of the three new 75-ton open-hearth furnaces of the Carnegie Steel Company at its Farrell, Pa., works was started on Monday, Oct. 9. The other two furnaces are expected to be ready for operation about Oct. 15.

The plant of the Great Western File Works, Beaver Falls, Pa., which has long been idle, has been sold to the Pittsburgh Radium Company, a new organization, which will partially rebuild the plant and equip it for the treatment of carnotite ores and the extraction of vanadium, uranium and allied products. The company announces it will have the plant in operation before Jan. 1. The purchase was closed by W. J. Stevenson, secretary; G. E. Erb, vice-president, and Henry Fitzpatrick, a director of the company, all of Pittsburgh. Samuel Jeffrey, Ithaca, N. Y., is president of the company.

The Pennsylvania Auto Wrecking Company, Pittsburgh, with a capital stock of $10,000, has been incorporated by Joseph H. Josselson, 712 St. Clair Street, Pittsburgh, Leon Bluestone and William Steinberg, to deal in automobile junk and other metal.

The Gilmore Fire Clay Company, Pittsburgh, with a capital stock of $50,000, has been incorporated by A. L. Gill, Germania Savings Bank Building, Pittsburgh, C. A. Bursner and D. E. Mitchell, to mine clay, coal, iron ore and other minerals.

The North East Foundry & Machine Company, North East, Erie County, Pa., with a capital stock of $25,000, has been incorporated by Frank G. Pottmeyer, Edmund A. Finnerty, William G. O'Malley and John J. Finnerty to operate an iron, steel and brass foundry.

The German Bronze Company, Erie, Pa., L. T. Briggs, president, is having plans prepared for an extension of its plant at Nineteenth and Chestnut streets, to cost approximately $40,000.

Kugel-Miner-Morse, Inc., Erie, Pa., with a capital stock of $5,000, has been incorporated by Henry K. Kugel, Pierce A. Miner and Henry L. Morse, to deal in iron and steel, shop and mill supplies, tools and machinery.

The A. M. Byers Company has banked its furnace at Girard, Ohio, for a few days while repairs are being made. There is a stock of metal in the furnace yard to take care of the company's mills.

The Barger Mfg. Company is fitting up a plant at Michigan and Buttles avenues, Columbus, Ohio, that will be used for the manufacture of fire extinguishers.

Penn Seaboard Buys National Steel Foundry

The Penn Seaboard Steel Corporation, 132 South Fifteenth Street, Philadelphia, Pa., has purchased the steel casting plant at New Haven, Conn., formerly known as the National Steel Foundry. A force of men is already at work at this plant making the necessary repairs to place it in operation and it is the expectation that steel will be made within 30 days. The original plant contained two 25-ton acid open-hearth furnaces and was operated for several years as a jobbing steel casting foundry, but went into the hands of a receiver about 10 years ago. It is understood that for the present steel ingots will be the principal product of this plant. Fred G. Wertz has been appointed manager and is already on the ground. The acquisition of this plant constitutes the fourth unit of the Penn Seaboard Steel Corporation recently organized, the other three being what were known formerly as the Penn Steel Castings & Machine Company, the Seaboard Steel Casting Company, both of Chester, and the Baldt Steel Company, New Castle, Del.

Central Iron & Steel Company Elects Officers

At a meeting of the stockholders of the Central Iron & Steel Company, Harrisburg, Pa., the following officers and board of directors were elected to take charge of the affairs of the company after the present receivers are discharged by the court: Officers—Robert H. Irons, president; Francis J. Hall, vice-president; L. D. Perry, secretary and treasurer. Board of directors—Edward Bailey, Charles L. Bailey, Jr., James M. Cameron, Donald McCormick and H. B. McCormick. The receivers will continue to operate the plant until the debts are finally liquidated and they are discharged by the court. From present indications the receivership will terminate some time next year.

Luria Brothers Open a Pittsburgh Office

Luria Brothers & Co., prominent dealers in old material, whose main office is in Reading, Pa., have opened a branch office in the Park Building, Pittsburgh, with D. L. Wilkoff as district manager. Mr. Wilkoff was formerly of the Wilkoff Company, dealing in old material in Youngstown and Pittsburgh. Luria Brothers & Co. are proprietors of the Donaghmore Iron & Steel Company, Donaghmore Station, Pa., and have extensive yards at that point as well as in Reading and Lebanon, Pa. They also maintain a New York office in suite 1277, 50 Church Street, of which M. L. Tyroler is manager.

May Sell United Steel Plant

The United Steel Company, Canton, Ohio, has practically concluded a deal for the sale of its plant to an important unnamed Eastern interest. The proposal will be submitted to the stockholders for their ratification at a special meeting, Oct. 14. The company announces that if the sale is consummated the plant will be greatly enlarged with the additional capital made available and that in the reorganization there will be no change in the management except that the Eastern interests will have representation on the directorate.

A first and final dividend of 1.43 per cent, amounting to $6,337, has been declared in favor of creditors of the Racine Iron & Metal Company, Racine, Wis., which failed in June, 1915. The total amount of allowed claims was $443,215, of which $417,464 was claimed by the Commercial & Savings Bank of Racine, also now defunct. The company did a large business and was managed by Morris F. Fox.

The Texas Resources Development Company, of which A. B. Wolvin, Duluth, Minn., is president, is considering plans for the construction of blast furnaces and a steel plant at Texas City, Tex. The company owns extensive iron-ore fields in Cass County, in eastern Texas. Among others who are reported to be interested in the company are H. Vanderhoof and W. R. Condict of Chicago.

Protection of Iron by Electroplating

The "Protection of Iron by Electroplating" was discussed by Oliver P. Watts and Paul L. DeVerter, of the laboratory of applied electrochemistry of the University of Wisconsin, in a paper before the American Electrochemical Society's convention in New York, Sept. 28, 1916. The conclusions of their investigation are as follows:

These experiments confirm the orthodox view that the superiority of electrogalvanizing over deposits of other metals for the protection of iron is due to voltaic action.

It has been shown that thin electro-deposits of zinc, copper, nickel and brass are full of holes, and therefore only the first may be relied on to prevent rusting, unless deposits are made much heavier than is at present the rule.

Deposits of nickel should exceed 0.0015 in. (0.038 mm.) in thickness in order to protect iron out of doors, and copper or brass plate should have three times this thickness. Even then it is a question how long such coatings will afford protection.

For the protection of electroplating of iron which is to be exposed to the weather, zinc (or cadmium) is the only metal worthy of consideration.

The foregoing experiments do not show that double coatings—zinc followed by copper or brass—are distinctly superior to a single heavy coating of the latter metals. If zinc is to be used advantageously, it should form the outer coating.

It is very desirable that some method be found for producing a uniform electroplate, free from the holes which were responsible for rusting in these experiments. Could such plating be done deposits of nickel, copper and brass would form a far more effective protection to iron than at present.

Alloys for Thin Ornamental Castings

The alloys used in the making of thin ornamental castings for cash registers were described in a paper by R. S. B. Wallace, National Cash Register Company, Dayton, Ohio, presented to the American Institute of Metals at its meeting at Cleveland, Sept. 13, 1916. Two classes of alloys are used, one for bronze finish parts and one for nickel plated parts. For bronze finish, the alloy is:

Copper	86.0 per cent
Tin	1.5 per cent
Lead	11.0 per cent
Zinc	1.5 per cent

1/20 oz. of manganese-copper per lb. of copper.

For the nickel plated parts the alloy is:

Copper	70.5 per cent
Zinc	26.5 per cent
Lead	2.0 per cent
Tin	1.0 per cent

In all mixtures the zinc, tin and lead are made into alloys which reduce the cost of weighing the necessary metals and eliminate the chances of error.

In melting the metal it must at all times be covered with charcoal. After the crucible has been placed in the furnace and the necessary coke around it, a few pounds of gates or scrap metal of the same composition required in the heat are placed in the bottom of the crucible, and the copper is placed across the top of the crucible at the same time. By the time the gates are melted the copper is ready to be placed in the crucible and as the copper melts it falls into the bath of metal made by the melting of the gates. After the metal has become properly melted the necessary alloy is added in proportion to the amount of copper.

Locomotive Orders

The American Locomotive Company has taken an order for 25 Mallet locomotives for the Chesapeake & Ohio, 10 Mallet locomotives for the Wheeling & Lake Erie and six 10-wheel locomotives for the Long Island Railroad. These, together with 3 small locomotives placed with the Baldwin Locomotive Works, make the recent orders 44. The Western Maryland is inquiring for 20 Mallet and the Carnegie Steel Company for 10 to 15 locomotives, for use in the Youngstown, Ohio, district.

Customs Decision

EMBROIDERY MACHINES

Another attempt to take the protective feature out of the present tariff's provision for embroidery machines has fallen flat before the Board of United States General Appraisers. An earlier move having for its object the inclusion of embroidery machines in the free list paragraph covering sewing machines failed. In the present case the same end was sought, but from a different angle. The decision just rendered by the general board was written by Judge Fischer, and, in the opinion of officials connected with the Department of Justice, should go a long way toward discouraging further litigation of this kind under the Underwood law.

The protestant was the Durbrow & Hearne Mfg. Company, which made an importation of steel shuttles at New York. The Government claimed that the shuttles were for use on embroidery machines, while the importing concern claimed the articles were for use on sewing machines. The collector of customs returned the articles at 20 per cent under the provision for "manufactures of metal not specially provided for" appearing in paragraph 167. The importer asked free entry under paragraph 441, as "parts of sewing machines," this paragraph also exempting sewing machines themselves from duty.

Judge Fischer, in his decision coincided in by the seven other members of the board, overruling the protest, said in part: "The testimony clearly and conclusively establishes the contention of the Government that these shuttles are used chiefly on embroidery machines, and chief use is the one essential and determinative fact which must govern in the decision of this case. Nor will it in anywise avail the importer to contend, as it here does, that embroidery machines consist merely of gang sewing machines, and that there is no real difference between sewing and embroidery machines."

Weight of Steel in New War Vessels

WASHINGTON, D. C., Oct. 10, 1916.—The Navy Department will, on Oct. 25, open bids for the construction of vessels appropriated for in the naval appropriation act of Aug. 29, 1916. Bids have already been opened for a fuel ship, a hospital ship and a gunboat, which were included in this appropriation act. The Bureau of Construction and Repair has prepared a statement showing the approximate weight of steel material in each type of vessel appropriated for in the measure. The officials of the Bureau state that at present it is not practicable to divide the tonnage into plates, sheets, angles, etc. The statement is as follows:

Type	Steel per Vessel, Tons	Total Steel of Each Type, Tons
4 Battleships	13,761	54,944
4 Battle cruisers	15,025	60,100
4 Scouts	2,997	11,988
20 Destroyers	325	6,500
1 Fuel ship	3,300	3,300
1 Hospital ship	4,000	4,000
1 Ammunition ship	4,000	4,000
1 Gunboat	548.5	548.5
30 Submarines	186.6	5,600

It is stated at the Navy Department that the selection of a site for the Government armor-plate plant will not be announced for at least two months. Hearings close on Thursday of this week. One hundred and twenty-five sites have so far been offered, and many of these will be visited by the board before a decision is reached.

W. L. C.

The F. E. Partridge Rubber Company, Ltd., Montreal, has been incorporated with a capital stock of $125,000 by George V. Cousins, Nathaniel R. Curry, Frederick E. Partridge, and others, to manufacture rubber tires and goods.

The Eichenburg-Murray Scrap Iron & Metal Company, Kansas City, Mo., has been incorporated with a capital stock of $15,000 by John A. Murray, Meyer Eichenburg, and others.

Machinery Markets and News of the Works

BETHLEHEM TO BUY CRANES

Government Wants Tools for Gun Shop

National Tube Company and General Electric Company Also Buying—Business on Pacific Coast Is More Active

The United States Government is in the market for a list of tools required for the Watervliet Arsenal, including a gun lathe with a swing of 113 in., and measuring 82 ft. from the face plate to the boring bench. But few firms can bid on such a machine.

The National Tube Company is inquiring for a notable list of tools for improvements it is making at Lorain, Ohio.

The Bethlehem Steel Company is taking bids on about 35 cranes required at its Maryland Steel Company plant, Sparrows Point, Md. The capacity of the cranes range from 5 to 175 tons.

The General Electric Company, Schenectady, N. Y., is in the market for several large engine lathes and boring mills.

Large orders have been placed for machinery to equip Russian automobile truck plants at Petrograd and Moscow.

Only good reports come from the machine tool manufacturing and distributing centers. In Cleveland the foreign demand, especially that from England, is stronger.

The volume of inquiry in Chicago is larger and of a varied character. In Milwaukee no large inquiries have been received, but inquiry for standard machine tools continues active.

The demand in Detroit grows, despite the fact that the high cost of building materials is handicapping factory extensions in that city, as it is elsewhere.

The Pacific Northwest and the San Francisco districts, which were slow to be affected by the prosperity of recent months, are now very active, a decided improvement having been shown in San Francisco in the past month. Not only are inquiries more numerous, but deliveries show a betterment. Several California shops are reported to be working on projectiles and other war equipment, while the shipyards are busy and making work for other industries.

Industrial enterprises in Canada, which received a set-back at the beginning of the war, are beginning to show more life.

New York

NEW YORK, Oct. 11, 1916.

The crane requirements of the Bethlehem Steel Company for improvements at the plant of the Maryland Steel Company, Sparrows Point, Md., constitute one of the largest inquiries ever received by builders. About 35 cranes, ranging in capacity from 5-ton to 175-ton will be purchased.

The General Electric Company has issued further inquiries, now asking for bids on one 42-in., two 36-in. and two 30-in. engine lathes and four 42-in. vertical boring mills.

The Hurlburt Motor Truck Company, Third Avenue and Harlem River, New York, referred to a week ago as in the market for tools, has plans for turning out a new one-ton motor truck, beginning Jan. 1. Certain driving parts will be manufactured, otherwise the truck will be an assembled machine. It is expected to turn out 5000 a year.

The Terench Company, 140th Street and Canal Place, Bronx Borough, New York, last week purchased four 1½-in. turret lathes. The company, whose name is a contraction of Terry & Tench, contractors, is finishing shells on a contract secured from the Bethlehem Steel Company. It is doing the work successfully in a smooth-running shop, employing about 100 men.

An imposing list of tools for delivery to the Government arsenal at Watervliet, N. Y., is before the trade. One item on which but few manufacturers can bid specifies a motor-driven gun boring lathe, having a swing of 113 in., the distance between face plate and boring bench to be 82 ft. Other tools called for are as follows:

One motor-driven horizontal boring mill, 4½-in. spindle.
Six No. 4 Brown & Sharpe universal milling machines.
Two No. 3 Brown & Sharpe universal milling machines.
One No. 5 Brown & Sharpe universal milling machine.
One No. 2 Brown & Sharpe universal milling machine.
One vertical surface grinder.
One vertical shaper.
Two universal tool grinding machines.
One vertical drill.
One 16-in. engine lathe.
One 4-in. turret lathe.
One 3-in. turret lathe.
One 1½-in. turret lathe.
One motor-driven air compressor, 2-stage, 19 x 12 x 16, duplex.

Structural fabricators, who have not been buying machinery for a considerable time, have lately issued several inquiries for punches and shears.

Business generally continues to hold up in an excellent manner. Dealers note a gain in shipments last month, and are pleased with the fact. Some deliveries are held back by difficulty in getting prompt shipment of electric motors, one such motor, special in character, requiring three and one-half to four months for delivery. Manufacturers of all kind look forward to a long period of activity.

Kraeuter & Co., Inc., 563 Eighteenth Avenue, Newark, N. J., manufacturer of drop forgings, is in the market for one 300 or 400-lb. drop-board hammer and one heavy-duty milling machine with 22 in. between centers.

The Foster Bros. & Chatillon Company, manufacturer of knives, Fulton, N. Y., had a serious fire Sept. 11, destroying a part of its plant. One week later the company was again operating and manufacturing such work as those buildings which were not damaged were able to produce. The burned buildings have been removed, foundation is already laid and machinery is being replaced where necessary. The company expects to be in full operation about Nov. 1. The loss is less than $20,000. The buildings which were destroyed were wooden and the plant is being rebuilt with brick and steel. C. E. Foster is president.

The Norwich Wire Works, Inc., Norwich, N. Y., has broken ground for another factory building which will be erected by Everett Wells at the rear of the present plant. The new building was completed July 1 when the wire works were moved from Front to State Street, but business has been increasing with such strides that another equally large building is needed. F. V. Fernaled is treasurer.

The Delaney Forge & Iron Company, Buffalo, has let contract for the erection of a forge and machine shop building to replace the one destroyed by fire several weeks ago, to cost approximately $50,000.

The Dunkirk Glass Company, Dunkirk, N. Y., will build additions to its plant on Lamphere Street which will double its capacity. The principal addition will be 80 x 200 ft., two stories, of brick. New furnaces will be installed.

The Arrow Head Mills, Fulton, N. Y., is taking bids for a one-story power plant, 40 x 50 ft.

The Holliday-Kemp Company, Woodside, N. Y., manufacturer of aniline dyes, has leased the Consumers Brewery building at that place and will equip it for the manufacture of dyes.

Incorporation papers have been filed by the Automobile Crankshaft Corporation, Albany, capitalized at $325,000, to manufacture automobiles, aeroplanes and tractors. J. M. Hibbard, Detroit, Mich., E. E. McCrone and W. C. Rice, 21 Second Street, Troy, N. Y., are the incorporators.

W. W. Wotherspoon, State superintendent of public works, Albany, is receiving sealed proposals for furnishing and in-

stalling new governor equipment for the hydroelectric power plant on the Erie Canal near the east end of Crescent dam and also for furnishing pumping plants along the Allegheny River and Olean Creek.

The Atlas Steel Castings Company, Buffalo, is building a concrete and steel addition to its foundry at Elmwood Avenue and the Erie Railroad.

The Ferris-Stevenson Corporation, Amherst, N. Y., has been incorporated with a capitalization of $150,000 to manufacture machinery specialties. W. Stevenson, Amherst; C. R. Stevenson, Buffalo, and A. Becker, 413 Mutual Life Building, Buffalo, are the incorporators.

The Cygnet Rear Car Company, Buffalo, manufacturer of trailers for automobiles and rear cars for motorcycles, has leased a three-story factory at 408 DeWitt Street and will equip it.

The Jamestown Chair Company, Jamestown, N. Y., has plans in preparation for alterations and additions to its factory, 80 x 300 ft., three stories.

The Bausch & Lomb Optical Company, St. Paul Street, Rochester, has completed plans for a one-story addition to its factory, 70 x 120 ft.

Work has been commenced on a foundry, 158 x 180 ft., to be erected at the plant of the Universal Winding Company, South Auburn, N. Y.

The Sauer-Georgi Mfg. Company, Buffalo, has been incorporated with a capital stock of $50,000 to manufacture special patented articles. A. J. Sauer, J. J. Georgi and C. F. Wheeler, Buffalo, are the incorporators.

The Acme Pattern & Machine Company, Buffalo, manufacturer of knitting and silk-weaving machines, has started construction of a factory at Niagara Street and Forest Avenue to cost $100,000. It will be ready for installation of machinery and equipment about Dec. 1.

The Island Paper Company, Tannery Island, Carthage, N. Y., C. W. Pratt, general manager, will build a machine shop, 40 x 80 ft.

The Sprague Electric Works of the General Electric Company, Bloomfield, N. J., has filed plans for the first section of its new reinforced-concrete addition, to cost about $90,000.

Miller, Broderson & German, 520 Broad Street, Newark, will make alterations and extensions in their automobile repair and machine shop, to cost about $7,000.

The Rubber & Celluloid Harness Trimming Company, Newark, will build a one and two-story addition to its plant on Hamburg Place, to cost about $50,000.

The Firestone Tire & Rubber Company, Akron, Ohio, has purchased property at Broad and Kinney streets, Newark, as a site for a three-story service station, about 50 x 170 ft. The plant is estimated to cost $125,000.

The Martin Dennis Company, 859 Summer Avenue, Newark, manufacturer of tanners' supplies, has awarded contract for a two-story brick addition to its plant, 46 x 160 ft., to cost about $25,000.

The Marden, Orth & Hastings Company, Newark, manufacturer of chemicals, will build a two-story brick ice-manufacturing plant and storehouse at Avenue R and the Plank Road, to cost about $20,000.

The Motor Car Devices Company, 845 Broad Street, Newark, has been incorporated with a capital of $100,000, to make automobile specialties. Horace Walker, R. L. Hubbard and Ralph Alton are the incorporators.

The Simmons Pipe Bending Works, Newark, manufacturer of pipe bends and coils, will build a one-story addition at the foot of Avenue D.

Schrenk & Co., Hoboken, N. J., manufacturers of mirrors, have increased their capital from $125,000 to $170,000, to provide for increased operations.

The Harris-Clark Company, Broad and Clark streets, Westfield, N. J., has been incorporated to manufacture engines, boilers and machinery, with a capital of $100,000. M. A. Harris, Lawrence A. Clark and E. C. Harris, Westfield, are the incorporators.

James Spence, Jersey City, will build an addition to his foundry at 917-921 Garfield Avenue.

The Calumet Iron Works, Newark, structural steel fabricator, has awarded a contract for alterations and improvements in its plant on Ball Lane.

The Titanium Alloy Mfg. Company, Niagara Falls, N. Y., has had plans completed for a one and two-story boiler house, 28 x 42 ft., to cost about $7,000.

Plans are being prepared for a two-story machine shop, 60 x 100 ft., for the Laing Machine Auto Repair Company, 412 Sycamore Street, Plainfield, N. J., to cost about $10,000.

The Roessler & Hasslacher Chemical Company, Perth Amboy, N. J., has awarded a contract for the construction of an addition to its boiler room, two stories, 26 x 59 ft., to cost about $3,000.

The Electrical Alloy Company, Morristown, N. J., has awarded contract to Henry R. Kent & Co., 141 Broadway, New York, for a one-story factory, 100 x 150 ft.

Bids will be received till 3 p. m., Oct. 18, for power-house equipment for the Union County Tuberculosis Hospital at New Providence, N. J. The George W. Knight Company, 1209 Firemen's Building, Newark, N. J., is the engineer.

Philadelphia

PHILADELPHIA, PA., Oct. 9, 1916.

The William Cramp & Sons Ship & Engine Building Company, Philadelphia, is remodeling its power plant to meet increased power requirements.

Bids are due Oct. 16 for a one-story brick and steel forging plant, 100 x 200 ft., for the Frankfort Arsenal, Philadelphia.

The Budd Wheel Corporation, capitalized at $2,000,000, has started the erection of a plant, with approximately six acres of floor space, at Twenty-fifth Street and Hunting Park Avenue, Philadelphia, for the manufacture of wire automobile wheels. The machinery, it is reported, will cost more than $500,000, and the plant will employ over 1500 mechanics. The Budd Corporation is an expansion of the Edward G. Budd Mfg. Company, manufacturer of pressed steel automobile bodies.

The construction of new buildings for the Pennsylvania Shipbuilding Company at Gloucester, N. J., is going rapidly forward and it is announced that by the middle of February the company expects to have 2600 men at work.

The H. A. May Foundry Company, Thirtieth and Ludlow streets, Philadelphia, will purchase one 60-in. cupola and blower and one 5-ton electric traveling crane for 46-ft. span.

The Mulconry Company, Fifty-fourth and Jefferson streets, Philadelphia, is seeking a turret lathe, spindle hole 2-2¼ in, swing 12 in. to 16 in., fitted with oil pumps, chip pan and wire feed.

James F. Griffith, 420 Meyer Street, Philadelphia, will buy a 40-in. to 50-in. lathe and a vertical boring mill of the same size. Good second-hand tools are acceptable.

It is reported that the Sun Shipbuilding Company, 1428 South Penn Square, Philadelphia, is about to start the construction of a one-story shop building, 60 x 128 ft., to cost about $10,000.

P. J. Collins, 24 North Wycombe Avenue, Lansdowne, Pa., has awarded contract to the Smith Hardican Company, Philadelphia, for a one-story machine shop, 12 x 108 ft., to cost $3,000.

The Sharples Separator Company, West Chester, Pa., will purchase a 36-in. x 36-in. x 10-ft. planing machine in good condition and a horizontal boring mill for about a 2½-in. bar and 4-ft. approximately between housings.

The Southwark Foundry & Machine Company, 400 Washington Avenue, Philadelphia, is in the market for one 500 to 700-kw. generator to run 150 r.p.m. and one 200 to 250-kw. generator to run 300 r.p.m., both for a 250-volt direct current.

Permit has been granted to the A. R. Raff Construction Company, 313 South Broad Street, Philadelphia, for alterations and additions to the factory and machine shop of W. F. Russell, to cost about $2,000.

Because of its increasing business, the O. K. Clutch & Machinery Company, Columbia, Pa., has had to move into larger quarters recently, and the employees are now working overtime to meet deliveries.

The Susquehanna Cut Glass Company, Columbia, Pa., is now turning out more than 100 barrels daily of its wares. An extension of the factory is reported now under contemplation.

The Cumberland Valley Utilities Company is the name of a new company which will take over the Chambersburg, Green Castle & Waynesboro trolley line, the Chambersburg & Shippensburg trolley, Waynesboro gas plant, Waynesboro electric light plant, Green Castle electric light, and the Shippensburg gas and electric light companies. A syndicate has closed options on these properties. The headquarters of the new company will be in Chambersburg and it is stated that a large sum of money will be spent improving the various utilities.

Construction work was started recently on the $500,000 power house of the Philadelphia Suburban Gas & Electric Company at Cromby, to supply the communities of Pottstown, Phoenixville and West Chester. The present plants at these places will be used as auxiliary stations. The new power plant will cost about $500,000.

The American Horse Shoe Company, Phillipsburg, N. J., is in the market for one 12 or 14-in. lathe and one 12 or 14-in. shaping machine.

The Benjamin Iron & Steel Company, Hazleton, Pa., is seeking a 12-in. swing second-hand vertical boring mill.

The Troy Engine & Machine Company, Troy, Pa., has had plans prepared by Fletcher-Thompson, Inc., engineers, 297 Market Street, Newark, for a one-story steel and concrete addition, about 60 x 145 ft.

The John A. Roebling's Sons Company, Trenton, N. J., manufacturer of wire and wire rope, has acquired a five-story factory at 223 Arch Street, Philadelphia, and will establish a branch manufacturing plant for its regular specialties, as well as the products of the New Jersey Wire Cloth Company, a subsidiary organization. The structure will also be used as branch offices.

R. B. Brown & Co., Camden, N. J., has been incorporated with a capital of $25,000 to manufacture talking machines. R. B. Brown, Philadelphia; P. M. Satterthwaite, Lansdowne, Pa., and W. Hancock Payne, Wynnewood, Pa., are the incorporators.

The Philadelphia Steel & Forge Company, Milnor and Bleigh streets, Philadelphia, has acquired a tract of land to be used for extensions to its plant.

The Pratt & Moser Motor Company, Philadelphia, has been incorporated with a capital stock of $25,000 by S. H. Bailey Mercer, 1815 North Sixteenth Street; A. Zimmerman, 5641 Larchwood Street; W. A. Herbert, 5430 Haverford Avenue; James J. Tauney, 5604 Spruce Street; A. V. Fox, 1502 Poplar Street, Pittsburgh, and Mahlon H. Dickinson, Swarthmore, to manufacture automobiles, motorcycles, etc.

The Santa-Marie-Biddle Company, Philadelphia, has been incorporated with a capital stock of $5,000 by A. Mercer Biddle, Jr., Torresdale, Pa.; Albert H. Santa Marie, Wawa, Pa., and Lawrence J. Glesson, 5137 Arch Street, to operate a garage and repair shop.

The Donecker-Heller Oil Refining Company, Allentown, Pa., with a capital stock of $25,000, has been incorporated by Edwin A. Donecker, 1501 Linden Street, Philadelphia, and others, to refine oil, etc.

The Inter-State Motor Company, Athens, Pa., has been incorporated with a capital stock of $7,500, by W. M. Snyder, Sheshequin, Pa.; S. O. Billings and B. B. Overfield, Athens, Pa., to operate a garage and repair shop.

New England

BOSTON, MASS., Oct. 9, 1916.

With the return of the employees of the Pittsfield, Mass., plant of the General Electric Company, New England metal-working industries are free from large labor disturbances. The men returned to work on practically the terms first offered by the management of the plant.

The New Departure Mfg. Company, Bristol, Conn., has awarded a contract for a three-story factory, 400 ft. long, to be erected on ground directly across the railroad tracks from its present factories. Besides the main building there will be an annex, 250 ft. long, one-story. The company now has under construction another large factory which will cost approximately $650,000, and the contract which has been awarded will bring the expenditure for new buildings within a year's period to about $1,100,000. The company has also awarded a contract for an addition to its plant at Elmwood, Conn., 60 x 86 ft., two stories, and for the building of an additional story, 50 x 60 ft., to one of its present buildings.

The Standard Oil Company of New York has purchased 21 acres of land on Wawarme Avenue, Hartford, Conn. The company engineers are planning two large plants, one a refinery, the other a distributing plant, which when completed will employ more than 2000 workmen. The site borders upon the Connecticut River, and it is planned to use material dredged from the river to grade a portion of the site. The deepening of the river will permit large barges to come from the docks of the Standard Oil Company of New Jersey directly to the Hartford plant. It is understood that construction work will begin at once.

The Barnum-Richardson Company, Lime Rock, Conn., is building at East Canaan, Conn., a retort plant for the manufacture of wood alcohol and acetate of lime, with charcoal as a by-product. The charcoal will be used in the company's blast furnaces at East Canaan and Lime Rock. It is the first plant of this type to be erected in New England.

The Fairmount Foundry Company, Woonsocket, R. I., has been incorporated with capital stock of $35,000. The incorporators are Matthew M. Sweeney, George E. Bouvier, Clifford Teachman and Charles W. Neyman. The new company will locate on Second Avenue near Fairmount Street. A 3-ton hand traveling crane for 30-ft. span and other used foundry equipment is required by the company.

Beaudry & Co., Inc., Boston, Mass., want a 36-in. to 40-in. open-side planing machine to plane 37 in. under cross rail to 12-ft. platen.

The Waterbury Brass & Bronze Company, Waterbury, Conn., has awarded a contract for the erection of a factory, 40 x 104 ft., one story, on East Main Street, adjoining the plant of the Manville Machine Company.

The Barney & Berry Company, skate manufacturer, Springfield, Mass., has awarded a contract for an addition, 16 x 43 ft., four stories, for washrooms.

The Wyman & Gordon Company, Worcester, Mass., is to build an office building, 68 x 68 ft., two stories, at Gold and Madison streets, to be connected with the factory by a bridge, 30 x 34 ft., at the second story, which will be used also as a drafting room.

The Mead-Morrison Mfg. Company, East Boston, Mass., requires a No. 1 Sellers or equal tool grinding machine and a 36-in. to 48-in. gear-hobbing machine for cutting steel pinions, both new or second-hand.

The Wollaston Foundry Company, Quincy, Mass., is asking bids on the erection of a foundry from private plans.

John W. Conway, 426 Broad Street, Hartford, Conn., has awarded a contract for a foundry, 69 x 30 ft., and 40 x 90 ft., one and two stories.

The Norton Company, Worcester, Mass., is beginning the erection of an addition, 44 x 138 ft., five stories, to its present administration building.

The American Brass Company, Waterbury, Conn., has awarded a contract for an addition, 50 x 201 ft., three stories, to its factory on Main Street.

The Chase Rolling Mill Company, Waterbury, Conn., is building a storehouse, 68 x 93 ft., two stories.

The Lehnert Textile Machinery Company, Boston, Mass., has been incorporated with capital stock of $10,000. The directors are H. H. Lehnert, president; George Blaney, 53 State Street, treasurer, and W. J. E. Sander.

The Mansfield Foundry Company, Mansfield, Mass., has been incorporated with capital stock of $150,000, by J. M. Bullard, president; Arthur B. Colvin, treasurer, and P. D. Dean.

The Franklin Needle Company, Franklin Falls, N. H., has let a contract for a two-story factory.

The Stockbridge Machine Company, 70 Abbott Street, Worcester, Mass., is building an addition, 66 x 80 ft., two stories, for office and factory purposes.

The Universal Grinding Machine Company, Fitchburg, Mass., has been incorporated with capital stock of $170,000, by Allen Hollis, president; Robert D. Gould, treasurer, and Thomas Allen, Jr.

The E. Horton & Son Company, Windsor Locks, Conn., has bought the plant of the Windsor Locks Machine Company, an adjoining property. This acquisition will add about one-third to the floor space of the company. It is reported that the Windsor Locks Machine Company has disposed of its special equipment for repairing paper mill machinery to the American Writing Paper Company, and that C. W. Sadler, president and manager, will devote his attention to a line of special machinery which he is developing.

The Wallace Barnes Company, Bristol, Conn., is seeking one 10 to 15-ton traveling crane for 40-ft. span for a 220-volt alternating current.

The A. H. Nilson Machine Company, Bridgeport, Conn., is building an addition, 25 x 47 ft., one story, to its plant on Bostwick Avenue.

The Clamping Devices Mfg. Company, Hartford, Conn., has been incorporated with capital stock of $75,000, by Frank M. Villa, James M. Motto, A. M. Le Roy of Hartford and Robert A. Fosdick of Stamford.

The Somers Company, Waterbury, Conn., has been incorporated with capital stock of $50,000, to manufacture machinery and metals. The incorporators are Joseph E. Somers, Robert D. Somers and Louis J. Somers.

C. Cowles & Co., manufacturers of carriage hardware, New Haven, Conn., have awarded a contract for an addition, 61 x 160 ft., five stories.

The Silex Company, Boston, Mass., has been incorporated with capital stock of $150,000, to manufacture percolators, heaters, etc. The directors are John T. O'Hare, 67 Milk Street, Boston, president and treasurer; H. M. Bridges and William T. Good.

Michael Blasberg, manufacturer of castings, Turners

Falls, Mass., is to erect an office and storehouse, 30 x 100 ft., on Avenue A.

The Off-Set Tool Company, Bridgeport, Conn., has been incorporated with capital stock of $25,000, by Daniel J. Trivers, Cyrus Barker and William J. Buckley.

The Atwood Machine Company, Stonington, Conn., is planning for an addition to its plant, and is moving some structures which now occupy land needed for expansion.

The Worcester Machine Screw Company, Beacon Street, Worcester, Mass., has recently purchased a tract of land in the Greendale section of Worcester, which it intends to use before many months for plant expansion.

The Bay State Metal Corporation, a company in process of organization, with capital of $250,000, has purchased four acres of land in Campello, Mass., on which it will build a plant for the manufacture of fireproof steel furniture. Walton H. Atwood, Boston, is president, and the directors include E. A. Norris, Harry C. Chabby, Charles R. Hillberg and N. E. W. Wilbur, all of Brockton.

The Foster Machine Company, Westfield, Mass., has been incorporated, with capital stock of $150,000. The directors are H. M. Davis, president; Ralph W. Dunbar, 75 Ames Building, Boston, treasurer, and H. C. Brookings.

The United States Vaporizor Company, Boston, Mass., has been incorporated with capital stock of $150,000, by Harvey J. Elms, president; George O. Olsen, 729 Morton Street, Mattepan, treasurer, and R. H. Elms.

Pittsburgh

PITTSBURGH, PA., Oct. 9, 1916.

Manufacturers and dealers in machine tools in this district continue to report active inquiries for heavy machine tools, such as lathes, planing machines, drill presses, milling machines, etc. Most of these inquiries come from iron and steel companies that are making large extensions to existing plants or else are building new works. A recent inquiry from the Brier Hill Steel Company, Youngstown, Ohio, contained a large number of heavy machine tools, most of which, it is understood, have been bought. Last week the National Tube Company, Pittsburgh, which is making large additions to its works at Lorain, Ohio, including a new blooming mill, open-hearth steel furnaces and by-product coke ovens, sent out an inquiry for motor-driven machine tools which are now being figured on, as follows:

One 24-in. heavy planing machine
One universal milling machine
One 15-in. slotting machine
One 18-in. slotting machine
Two 32-in. engine lathes, 8 ft. between centers
One 24-in. engine lathe, 15 ft. between centers
One 24-in. engine lathe, 6 ft. between centers
Four 20-in. engine lathes, 5 ft. between centers
One 60-in. horizontal boring mill
One 2-in. turret lathe
One 36-in. x 23-ft. engine lathe
One 36-in. x 36-in. x 12-ft. planing machine
One 60-in. carwheel lathe
One 72-in. plain radial drilling machine
One 26-in. Travers head shaping
One toolroom lathe
One 72-in. portable slotting machine
One 52-in. hobbing machine
One 36-in. vertical turret lathe
One 5-ft. universal radial drilling machine
One 24-in. shaping machine
One 34-in. shaping machine
One lathe tool grinding machine

Baltimore

BALTIMORE, MD., Oct. 9, 1916.

Plans have been completed for the establishment of the Kelly-Springfield Tire Company, automobile tire manufacturer, in the city of Cumberland, Md. A large plant will be erected there, and in time the entire interests of the company, which are now centered at Akron, Ohio, will be removed to Cumberland. About 4000 men and women will be employed from the start, and the payroll will eventually amount to $750,000 a month. The new plant is expected to consume 1000 tons of coal daily.

The Elizabeth Iron Works, Norfolk, Va., has been incorporated with $50,000 capital stock. W. M. Jones, Norfolk, is president.

The Crawford-Vaughan Boiler & Locomotive Works, Richmond, Va., has been incorporated with $40,000 capital stock. James B. Crawford is president and general manager.

The Baltimore Rivet & Mfg. Company, Baltimore, Md., has been formed by John T. Newkirk, 2929 East Monument Street, B. Frank Seal, and others.

With $40,000 capital stock the Interstate Tool Company, Richmond, Va., has been formed. J. J. Bailey is president.

The F. O. Smith Shipbuilding Company, Brambleton, Va., contemplates the construction of additions to its plant.

With capital stock of $50,000, the Enterprise Mfg. Company, Radford, Va., has been incorporated to manufacture veneers, etc. F. J. Wells is secretary.

A garage, 116 x 122 ft., including a repair shop, will be built at Eleventh and King streets, Wilmington, Del., for the Delaware Motor Sales Company.

A new building, which will be constructed for the Electric Hose & Rubber Company, Twelfth and Dure streets, Wilmington, Del., will be 40 x 102 ft., and will cost about $10,000.

Plans are being made, it is reported, by the Pocahontas Consolidated Collieries, Pocahontas, Va., for the construction of a machine shop.

The Dixie Mfg. Company, manufacturer of exhaust fans and dust-collecting systems, Russell and Stockholm streets, Baltimore, will build an additional factory at Russell and Ostend streets. James W. Toohey is president.

Plans are being made by the Bethlehem Steel Company, Sparrows Point, Md., for the construction of two 900-ft. piers. One will be known as the export pier and the other as the import pier.

Chicago

CHICAGO, ILL., Oct. 9, 1916.

Inquiry for machine tools has been coming out the past week in noticeably large volume, and, despite the inability of local interests to satisfy a large part of the demand, many sales have been closed representing values from $5,000 to $10,000. The inquiry is exceedingly varied in character and arises equally from the building of new shops, the extension of equipment and export requirements. There is inquiry in this market for 30 small automatics and a like number of large lathes, both of which could normally be filled more logically in the East. Other demand covers boring mills, milling machines and drills considerably in excess of the available supply of tools. Buyers inquiring for machines of some particular make are taking any tool that can be had. A partial return to the earlier conditions of the machine-tool market appears to have been made. The manufacturers seem to be making no headway against their backlog of orders, and deliveries of standard tools are unimproved.

The Alfred O. Blaich Company, 1954 Clybourn Avenue, Chicago, has awarded contracts for the erection of a case hardening plant, 47 x 109 ft., to cost $7,000.

The Imperial Brass Company, 512 South Racine Avenue, Chicago, has awarded contracts for a six-story addition to its factory. An expenditure of $85,000 is contemplated.

The Chicago, Milwaukee & St. Paul Railroad is planning the erection of car shops and a roundhouse at Sioux City, Iowa, construction to begin in the spring. An estimated cost of $500,000 is reported.

The Gulbranen-Dickenson Company, 620 North Kedzie Avenue, Chicago, manufacturer of piano player actions, will build a two-story addition to its factory.

A. Stein & Co., Chicago, will erect a five-story brick factory at 1145-9 West Congress Street, to cost $100,000. A. S. Alschuler, 28 East Jackson Boulevard, is the architect.

W. L. Eaton will build a three-story brick factory at 28-31-37 South LaSalle Street, to cost $50,000. W. H. Pruyn, 122 South Michigan Avenue, is the architect.

The Metal Specialties Company, 3200 Carroll Avenue, Chicago, has had plans prepared by Davidson & Weiss for a four-story brick factory to cost $100,000.

O. Baun, Kedzie Avenue and Thirty-first Street, Chicago, will build a one-story foundry, 40 x 200 ft., costing $10,000.

The Carolus Mfg. Company, Sterling, Ill., manufacturer of metal clippers, is building an addition to its shops.

The S. Ward Hamilton Company, Chicago, is erecting a factory at Harvey, Ill., where it will manufacture steel specialties.

The Weisner Mfg. Company, Rockford, Ill., has been incorporated with a capital of $5,000 by C. E. Swenson, H. W. Weisner and E. C. Kraner.

Geneseo, Ill., has issued bonds in the sum of $48,000 for the construction of a municipal electric light plant.

The National Iron Company, Duluth, Minn., will erect a pattern shop adjoining its plant to cost $10,000.

Detroit

DETROIT, MICH., Oct. 9, 1916.

Machinery manufacturers report a continuous increase in demand. Building operations continue unabated and factories are increasing their facilities, but more moderately than last spring and early summer. The high price of materials and the unusual scarcity of labor are handicapping operations. The labor difficulty is being overcome somewhat, as large automobile factories are cutting down their working forces. The men released, however, are mostly unskilled workmen.

The Perlman Rim Company, Jackson, Mich., is working on an addition to its factory, 100 x 440 ft. A similar unit has just been completed; also an addition, 80 x 380 ft. These were made necessary by increased business.

The Michigan Malleable Foundry Company, St. Joseph, Mich., has decided to increase the size of the building now under way. One building, 100 x 300 ft., is being rushed to completion and an addition, 60 x 80 ft., will be begun at once.

The Superior Foundry Company, Holland, Mich., recently organized, has found it necessary to increase its floor space 5000 sq. ft. It has just secured a contract which calls for 1500 tons of castings a year.

The Springfield Body Company, Detroit, will increase its capital stock for the construction of its new plant, to be ready for operation Jan. 1.

The Swiss Mfg. Company, Chicago, manufacturer of magnetos, will move to Monroe, Mich., at once. For the present it will utilize the plant of the Elkhart Mfg. Company, but is having plans prepared for several additions.

The MontaMower Company, Traverse City, Mich., has purchased a tract of land near the city and expects to start Jan. 1 the manufacture of 10,000 mowing machines, the output planned for 1917. Bert Montague is president.

The Columbia Motors Company, Detroit, has acquired the Argo Electric Vehicle Company, Saginaw, Mich., and will manufacture a six-cylinder automobile. A factory has been secured and the necessary machinery will be installed at once. The officers are J. G. Bayerline, president; William E. Metzger, vice-president; A. T. O'Connor, secretary and treasurer.

The Baker-Vawter Company, Benton Harbor, Mich., manufacturer of metal files and furniture, will erect a two-story factory, 60 x 200 ft.

The Monroe Binder Board Company, Detroit, Mich., has had plans drawn for a new box board factory which it has decided to erect at Monroe, Mich., at a cost of about $100,000, with facilities for duplicating the initial installation, giving a plant to cost in all about $1,000,000. It maintains a plant at Monroe, embracing several acres and another at Aurora, Ill., covering about 14 acres.

Cleveland

CLEVELAND, OHIO, Oct. 9, 1916.

The foreign demand for machine tools is more active than for some time, particularly from Great Britain. The volume of orders for turret lathes continues heavy, but consists mostly of small lots. The local demand for small lots of machine tools is large, the better grade of machines for tool room purposes being more active. Most buyers want early shipments and not much prospective business is placed, as manufacturers are unable to make deliveries for several months. The demand for storage battery trucks and locomotives for industrial purposes continues very heavy. Twist drill manufacturers report no falling off in the heavy demand and are three or four months behind on deliveries. A local twist drill manufacturer the past week turned down a very large export order, offered at attractive prices, because it would have been unable to properly take care of its domestic trade.

The Atlas Car & Mfg. Company, Cleveland, has placed contracts for additions to its plant which include an erecting building, 160 x 160 ft., to be joined to the main building; a blacksmith shop, 80 x 80 ft.; a pattern shop, 80 x 80 ft.; a pattern storage building, 60 x 100 ft., and a power house, 60 x 60 ft. A mezzanine floor will be provided in a portion of the main building to provide space for light machine work. Two 250-hp. boilers and a generator will be installed in the power house. The main building will probably be provided with two 25-ton and some smaller cranes. The steel buildings will be erected by the Penn Bridge Company.

The Grant-Lees Gear Company, Cleveland, will erect an addition to its plant to cost $30,000.

The National Screw & Tack Company, Cleveland, has acquired a site, 45 x 143 ft., adjoining its present plant, on which to build additions.

The Cleveland Clutch Company, Cleveland, has been incorporated with a capital stock of $10,000 by C. A. McMorris and others.

A new malleable iron foundry will be established in Toledo, Ohio, by the Houghton Malleable Castings Company, with temporary office at 1151 Ohio Building. The new company is installing equipment in the old Wilkes foundry building on Woodville Street and the Wheeling Belt Railroad. I. L. Houghton, formerly with the National Malleable Castings Company and the U. S. Malleable Castings Company, is president and treasurer.

The Electric Converter Company, Toledo, has been incorporated with a capital stock of $50,000 by M. L. Groves, M. C. Delaney, and others.

The Toledo Shipbuilding Company, Toledo, will build a four-story pattern storage building, 30 x 64 ft.

The Ironwood Mfg. Company, Bellefontaine, Ohio, maker of automobile accessories and farm implements, is contemplating the enlargement of its plant.

The Stevens Metal Products Company, Niles, Ohio, is equipping a plant to manufacture metal casks. Operations are expected to begin about Nov. 1.

The M. & D. Mfg. Company, Girard, Ohio, recently incorporated with a capital stock of $75,000, has purchased the vacant plant of the Ohio Sash Weight Company near Girard and will remodel the buildings and erect an additional structure, 40 x 100 ft. It will manufacture electric, gas and gasoline sadirons, etc.

The Pressed Steel Company, Grafton, Ohio, will erect a one-story factory, 40 x 145 ft.

Milwaukee

MILWAUKEE, WIS., Oct. 9, 1916.

Tool builders report an active demand for standard types, but orders are for single tools or very small lots, no large-sized inquiries having come in for some time. Buying seems to be mainly for replacements and equipment of enlarged shops. All plants are operating to capacity, and practically no relief is in sight before May 1. New business is being booked at a very satisfactory rate.

A feature of the situation in this district is that some important shop extension work which was postponed since last year because of the inability to get equipment, is now being undertaken.

The Milwaukee Dairy Supply Company, 934 Thirtieth Street, Milwaukee, is ready to proceed with plans for erecting a new factory and machine shop at Thirtieth and Burleigh streets. This project was deferred early this year because of the inability to procure equipment and because contractors were unable to guarantee deliveries of structural steel, etc. The main building will be of brick and steel, 120 x 127 ft., one-story and part basement. Herbst & Hufschmidt are the architects.

The E. A. Swendson Motor Company, 722-724 National Avenue, Milwaukee, is taking bids for a brick and steel garage and repair shop, 50 x 140 ft., one-story and basement.

The Osborne Casting Company, Racine, Wis., is a new company, which is establishing a moderate-sized gray-iron foundry, to be ready for operations on or before Jan. 1. John H. Osborne and Charles G. Holmes, who have had years of experience as foundrymen, are investing from $20,000 to $25,000 in a new casting shop and pattern works at Layard Avenue and the Chicago and Northwestern Railroad tracks. About thirty skilled men will be employed at the start. Enough business has been booked to insure a long run.

The Simple Gas Engine Company, Ashland, Wis., which interrupted production about six months ago to make changes in its designs, is preparing to resume operations and will build a new type of internal combustion engine in five different sizes.

Shaw & Kren, 1171 National Avenue, Milwaukee, will build a one-story machine shop, 50 x 74 ft., of concrete and brick, on South Pierce Street. J. George Shaw, manager of the Milwaukee Steel Foundry Company, 157 Virginia Street, is president.

W. Heck, Kewaunee, Wis., is in the market for an 18-in. lathe, a drill press, a milling machine, an oxy-acetylene welding unit, and motor-generator set, for automobile repair work.

The Dumphy Boat Works, Eau Claire, Wis., will build a new factory on the river front, to be of frame, iron-clad.

The Perfex Radiator Company, Racine, Wis., maker of automobile, motor-truck and tractor radiators and cooling devices, started operations in its new factory Oct. 9. The building is 75 x 255 ft., and has a capacity of 400 radiators daily. The factory represents an investment of $50,000. F. M. Opitz is president.

The Western Malleables Company, Beaver Dam, Wis., which recently added automobile parts to its general line of railroad and other malleable castings, is erecting a brick and steel addition, 90 x 26 ft., to its Elm Street foundry, where a larger coreroom and new sand sheds also are being provided. A new air compressor room is being erected at the South Street plant.

The Johnson & Field Mfg. Company, Racine, Wis., maker of fanning mills, is operating in a brick building owned by the American Seating Company and probably will make no decision until Jan. 1 as to rebuilding its plant damaged by fire.

The Gillette Safety Tire Company, Eau Claire, Wis., is installing machinery and will start production Oct. 16. Ground has been broken for the office building, 50 x 80 ft. R. B. Gillette is general manager.

The Fisher Fish Company, Green Bay, Wis., will build a new cold storage unit, 50 x 135 ft., two-story and basement, and awarded the contract to J. H. Geniesse. It will be of frame and corrugated iron.

Fire in the plant of the Green Bay Foundry & Machine Company, Green Bay, Wis., resulted in a loss of about $1,500.

Indianapolis

INDIANAPOLIS, IND., Oct. 9, 1916.

The Madison Motors Company, Anderson, Ind., announces that the Madison Motors Corporation with a capital of $2,000,000 will take over the former company. Cecil Gibson will be president of the new organization. Associated with him are C. D. Edinburg, general manager of the American Maize Products Company, New York; W. F. Wickham, president of the Wickham Coal Company, St. Louis; Paul H. Haynes, attorney, Anderson; G. S. Sarber, Indianapolis, and H. M. Caldwell, Evanston, Ill.

The South Bend Machine Tool Company, South Bend, Ind., will purchase several plain knee-type milling machines with 30 to 40-in. table feed. Good second-hand tools will be accepted.

The Automatic Register Sales Company, Indianapolis, has been incorporated with $100,000 capital stock to manufacture accounting machines. The directors are Benjamin Boose, John R. Hubbel, John G. Wimberg, C. B. Enlow and P. C. Kittle.

The Swartz Electric Company, Indianapolis, manufacturer of automatic light and power plants, will build an addition to its factory to cost $20,000, doubling the capacity of its plant.

The Metal Auto Parts Company, Indianapolis, has completed plans for the erection of a new plant to cost $80,000. B. E. Thompson is president and general manager.

The American Metal Furniture Company, Indianapolis, has been incorporated with a capital of $10,000 by Joseph A. Miner, Stanley C. Brooks and Edward J. Bennett.

The Buettner-Shelburne Machinery Company, Terre Haute, Ind., will build an addition to its plant and install new machinery.

The Huse Appliances Company, Gary, Ind., has been incorporated with $100,000 capital stock to manufacture fuel-saving devices. The directors are C. W. Huse, D. F. Van Lieu and Carl Schmidt.

The Shoals Light & Power Company, Shoals, Ind., has been incorporated with $10,000 capital stock. The directors are George A. Harrop, Benjamin C. Johnson and Lee D. Hinċher.

Richmond, Ind., through the efforts of its Commercial Club, has raised a factory fund of $100,000.

The Excell Furniture Factory, Shelbyville, Ind., has been sold to C. A. and Carl Tindall and S. L. Dorsey, Shelbyville, and Frank Gerling, Connersville. The company will probably be reorganized as the Tindall-Dorsey Furniture Company.

The Stewart Brothers Company, Montpelier, Ind., has been incorporated with $6,000 capital stock to manufacture household articles.

The Rex Buggy Company, Connersville, Ind., has changed its name to the Rex Mfg. Company.

Joseph Burke and Egbert Gazell, receivers for the William H. Clore Plow Works, Washington, Ind., have been ordered by the court to offer the factory for sale for not less than $40,000.

The Hardware Specialties Company, Wabash, Ind., has been incorporated with $15,000 capital stock to manufacture harness and hardware supplies. The directors are Nelson and Holmes Hunter and Aline Mattern.

At the annual meeting of the Sefton Mfg. Company, Anderson, Ind., the following officers were re-elected: O. H. Hicks, Redlands, Cal., president; J. E. Clenney, Chicago, general manager; Winfield T. Durbin, Anderson, vice-president.

H. R. Humphries & Co., Corydon, Ind., manufacturer of woodenware, will move their plant to New Albany, where it will be enlarged. Automobile bodies and parts of wagon beds will be added to their products.

Cincinnati

CINCINNATI, OHIO, Oct. 9, 1916.

Additional orders for different machine tools have been lately received from Russian agents, and the export business is generally very satisfactory. The call for portable electric drilling machines from abroad is better than at any time since this particular industry was started. The domestic machine tool trade is also holding up very well, but late orders are mostly from automobile and auto-truck manufacturers.

Boiler and tank makers are busy, and there has lately been a much better demand for large high-pressure boilers. The wood-working machinery business shows some improvement. The foundries are still working at full capacity, with only a few exceptions to be noted.

The Cincinnati Artificial Leather Company, Cincinnati, has been incorporated with $15,000 capital stock, and will fit up a plant on Wyoming Avenue for the manufacture of artificial leather. James Reid is president.

The Stevens Pressed Brick Company, Cincinnati, is a newly formed company that intends establishing a plant for the manufacture of building brick and tile. Fremont C. Stevens is one of the principal stockholders.

The United States Machine Tool Company, Cincinnati, a firm of recent origin, is having plans prepared for a plant to be erected on Burns Street. The proposed structure will be 70 x 90 ft., of brick and concrete. Equipment details are not yet available.

It is reported that the Fischer Specialty Mfg. Company, manufacturer of screw machine products, Cincinnati, contemplates making an addition to its plant on Reading Road.

E. T. Gardner, Middletown, Ohio, has purchased the plant of the National Boxboard Company, and will add new equipment.

The Recording & Computing Machines Company, Dayton, Ohio, is adding to its equipment in order to take care of an order recently received for shell detonating devices.

Springfield, Ohio, is changing the location of its repair shop that is operated for keeping its fire-fighting and other city vehicles in repair. Very little new equipment will be needed.

The Columbus Show Case Company, Columbus, Ohio, whose plans were recently mentioned, has let contract for an addition to its plant on Grant Avenue.

The Central South

LOUISVILLE, KY., Oct. 9, 1916.

Iron, steel and machinery interests of this section are citing the prediction of Henry Walters, chairman of the board of directors of the Louisville & Nashville Railroad, that the end of the war will see the beginning of generous prosperity for the whole South as their view of the outlook for business. They propose to make preparations accordingly, and report that much of the immediate business they are handling is based on expectations of their customers for continued substantial prosperity in the South. No let-up is found to the volume of orders and inquiries in every line canvassed, shortage of materials and shipping facilities being the principal hindrances. Farm machinery manufacturers are especially active.

Fire Oct. 6 destroyed the power house and other buildings of the Monarch Coal Company, Middlesboro, Ky., with a loss estimated around $5,000.

The Commercial Automobile Company, Lexington, Ky., will equip a plant for assembling automobile running gears and bodies and for the manufacturing of bodies, etc. Equipment to cost $8,000 will be installed. W. R. Williams is president.

The American Cast Iron Pipe Company, Chicago, Ill., has purchased the plant of the Harlan Water & Ice Company, Harlan, Ky., from the receiver, and plans to make extensive improvements. A. A. McCorkle is manager.

The Hirsig Auto & Supply Company, Nashville, Tenn., has been incorporated with capital stock of $25,000, by W. G. Hirsig, C. P. Healy and others.

The Stanley Motor Car Company, Chattanooga, Tenn., has been incorporated with capital stock of $10,000, by Z.

C. Patten, Jr., O. B. Andrews, A. T. Whiteside and others; will equip a garage.

The Bristol Traction Company, Bristol, Tenn., has begun construction of a power dam across the Holston River at Emmetts, Tenn., and will transmit power to that city.

The Cole Motor Sales Company, Knoxville, Tenn., has incorporated with $25,000 capital stock, by Robert M. and H. H. Lindsay, Robert S. Young and others.

Birmingham

BIRMINGHAM, ALA., Oct. 9, 1916.

Machinery dealers report business approaching about what they can well take care of. Small engines and pumps and gasoline engines are in strong demand. Ensilage cutters are on the active list. Mine and mill machinery is sought. Collections have improved with the high prices obtained for cotton and sales of live stock and other diversified farm products. Better conditions than in several years appear to be forming.

H. C. Murnan, Memphis, Tenn., will establish a shipbuilding plant and drydock in Mobile, having purchased water front property for that purpose. The initial plant is to cost $50,000.

Martin O'Rear, Jasper, Ala., has sold 13,000,000 ft. of timber to Monroe Aaron, Cordova, Ala., and Henry McNeal, Baldo, Ala., who will establish two sawmills at once.

The Barwick Hoe Works, Macon, Ga., has been incorporated with a capital stock of $25,000 by J. W. Barwick and others, and plans to establish a plant for the manufacture of hoes, plows and other farming implements.

John L. Herring and others, Tifton, Ga., propose to build a meat packing plant and are now forming a company with $500,000 capital to construct a plant estimated to cost $200,000.

St. Louis

ST. LOUIS, MO., Oct. 9, 1916.

The machine-tool business continues at a very satisfactory aggregate, but with little or no special feature. New demand is keeping up steadily, though little disposition is shown to put out calls for large lists. For the most part, when machine tools are wanted excursions into the market are made and orders placed wherever the necessary equipment is found. Extensions, replacements and purchases for new industries continue and are of the broadest character.

The Wrought Iron Range Company, St. Louis, Mo., will erect an addition to its machine shop.

The Emil Sieloff Provision Company, Natural Bridge Road and Newstead Avenue, St. Louis, has acquired a site adjoining its plant for the erection of a cold storage plant, to be electrically operated.

The Brilliant Sign Company, St. Louis, Fred A. Kehl president, is erecting a building for the manufacture of electrical sign and display devices.

The Cosmic Products Company, St. Louis, has been incorporated with a capital stock of $10,000 by James M. and John W. Matlock, and others, to manufacture oil burners.

Charles L. Hamer and O. W. Clifton, Rockport, Me., have acquired a franchise to equip a complete new electric light and power plant to replace the municipal plant.

The St. Joseph Lead Company, Herculaneum, Mo., will install two Marcus conveyors at its sintering plant.

The American Express Company, Kansas City, Mo., will erect and equip a garage and repair shop at a total cost of $70,000.

Paris, Mo., will receive bids for the installation of two electrically driven centrifugal pumps, etc. George C. Blakey is superintendent.

The Arenzville Light & Power Company, Arenzville, Ill., has been incorporated with a capital stock of $10,000 by John G. Pratt, J. G. Neiger, and others, and will equip a municipal waterworks and electric light and power plant.

The Aluminum Ore Company of America, East St. Louis, Ill., has acquired 56 additional acres adjacent to its present site. It has also bought a fleet of sixteen barges to transport its ore from its Arkansas mines to East St. Louis, Ill.

E. L. Bruce & Co., Little Rock, Ark., manufacturers of hardwood flooring and trim, are in the market for saws, resaws, matchers, planers, moulders, trim saws, filing room tools, engine, etc.

The Pine Bluff Company, Pine Bluff, Ark., has increased its capital stock from $1,200,300 to $2,000,000 to cover improvements in its waterworks plant, electric light plant, etc.

The Ponca Refining Company and Sub Oil Company, Ponca, Okla., the Cushing Refining Company, Cushing, Okla., and the Producers Refining Company, Gainesville, Tex., have been acquired by Henry L. Doherty & Co., New York, and it is reported extensive pipe lines and pumping equipment are planned.

Cosden & Co., Tulsa, Okla., have increased their capital stock to $8,000,000 and their bonds to $6,000,000 to increase their plant capacity and operations.

The Safety Pipe Lock Company, Shawnee, Okla., has been incorporated with a capital stock of $15,000 by C. C. Nash, R. B. Bond and W. L. Chapman to manufacture stove pipe locks.

Marlow, Okla., will expend about $25,000 on a sewer system, including a disposal plant. A similar amount will be expended on waterworks equipment, including pumps, generator, motor, etc.

The cotton gin of Case Brothers, Shawnee, Okla., which has been burned with a loss of about $7,000, will be re-equipped.

Texas

AUSTIN, TEX., Oct. 7, 1916.

An unusually large demand exists for machinery for equipping manufacturing plants. The small tool trade is also brisk. Banks report that their deposits are heavier than ever before, due to the proceeds of the cotton crop, which is now being marketed.

The Pierce-Fordyce Oil Association, Texas City, is having plans prepared for an addition to its refinery, to be used for a canning factory. The proposed plant will be capable of turning out 10,000 cans and 5000 wooden cases per day for canning the various grades of oil. It will cost about $100,000. J. P. Gillen is superintendent.

The Texas City Transportation Company, Texas City, will build and equip oil docks and warehouse at an expenditure of $50,000.

The Texas Bridge Company, Weatherford, has been incorporated with a capital stock of $15,000. R. P. Lowe is a stockholder.

The Farmers Gin Company, Barstow, will build a cotton gin to cost $6,000.

The Dallas Boiler Works, Dallas, has been incorporated for the purpose of operating a boiler manufacturing plant. The company has a capital stock of $50,000. C. R. Moore is a stockholder.

The City Commission, Houston, has prepared plans for a reinforced concrete municipal warehouse to cost $350,000. It will be equipped with carriers and other machinery for handling goods.

The cottonseed oil mill of the Frio County Oil Company, Pearsall, which was recently destroyed by fire, will be rebuilt at a cost of about $20,000.

The Bushbert Gin Company, Deport, will build a new cotton gin, to cost $8,600.

The oil refinery and oil compound manufacturing plant of the Walker Refining Company, Austin, which was destroyed by fire a few days ago at a loss of $75,000, will be rebuilt.

San Francisco

SAN FRANCISCO, CAL., Oct. 3, 1916.

Reports from local machinery merchants show a decided improvement within the last month, especially in machine tools. Not only are inquiries increasing, but orders are coming through in better shape, many buyers being no longer deterred by slow delivery. The shipbuilding shops are constantly in the market, and some of them are getting out new specifications for heavy equipment. Government business is a very important item, including not only various large tools for the Navy Yard, but considerable shop equipment for new vessels; and a good many tools are also being bought for privately-owned steamers. Several California shops are also working on Government orders for projectiles and other war equipment. Demand for general shop and foundry supplies has for several months been surpassing all former records, and is keeping up well. The outlook for the near future is considered very encouraging, as there are many projects in contemplation, and capital seems easier to obtain than for some years. All sorts of special machinery for miscellaneous manufacturing processes is in good demand.

The Richmond Machine & Boiler Works, San Francisco, has been incorporated with a capital stock of $50,000 by A. J. Timmons, E. Ott and F. Reishert.

The Gould Compensating Gear Company, San Francisco, has completed arrangements for the manufacture on a large scale in the East of a differential device, controlled by this company. Alfred R. Ruff is secretary.

The Standard Gas Engine Company has moved its offices

and salesroom to its plant in Oakland. The equipment recently purchased from the Corliss Gas Engine Company, Petaluma, has also been moved to Oakland and is being overhauled, many of the tools being remodeled for special-purpose work.

The Main Street Iron Works, San Francisco, is building several 1000 hp. marine steam engines for wooden vessels under construction in the Northwest.

A. A. Haskins, Hollister, Cal., who is operating a quarry, nearby, plans to build an aerial tramway from the plant to that town.

The Valley Foundry, Fresno, Cal., is building a brick addition, 50 x 75 ft., to its plant.

The Union Iron Works, San Francisco, has secured a permit to build a powerhouse to cost $22,500 at its new shipbuilding plant in Alameda.

Considerable equipment is being purchased for the production of potash and other chemicals from kelp. E. K. Woods, of the Hercules Powder Company's plant at La Jolla, near San Diego, was recently in San Francisco for additional machinery. The Verona Products Company, Santa Barbara, Cal., is building a large kelp reduction plant, and has ordered a number of power boats, etc. The International Potash & Fertilizer Company is being organized at Los Angeles by Dr. R. S. Oppenheim and others to build a kelp fertilizer factory.

The Stauffer Chemical Company has secured a permit to build an oil-refining plant in addition to its factory in West Berkeley, Cal.

The Pacific Northwest

SEATTLE, Oct. 3, 1916.

Machine tools, both new and second-hand, are in good demand. Repair work in all lines is in demand, and a number of first-class machine shops have been placed in operation during the summer in Puget Sound cities.

The Walstad Machine & Electric Company, Tacoma, Wash., has moved from the city waterway to the new tideflats factory section in Tacoma, where it occupies a two-story building, 50 x 150 ft. The company has recently installed new equipment. It manufactures structural iron work, machinery, etc.

The Duggan-Cropper Mfg. Company, Everett, Wash., has been incorporated for $50,000 by D. J. Duggan and S. Cropper. It will establish a factory to manufacture patented devices.

The Utah-Idaho Sugar Company, which plans establishment of a sugar factory in North Yakima, Wash., announces that the required acreage has been signed.

The Western Iron & Wire Works Company, Tacoma, has moved its plant from South Twenty-first and C streets, to the new tideflat industrial section, where it occupies a three-story frame building, 80 x 100 ft. The company manufactures ornamental iron and wire and has made many improvements in its new location. B. E. Paul is president and manager.

The Pacific Boiler Works has moved from 2224 East D Street, Tacoma, to the tideflat section. Donald McGregor is the proprietor.

The North Alaska Salmon Company, Seattle, has been incorporated for $700,000 by Phillip Larmon and H. W. Hardy, and plans the establishment of a salmon cannery nearby.

It is reported the Star Lumber Company, St. Paul, Minn., plans the establishment of a pulp mill at Reedsport, Ore., where it owns several thousands of acres of spruce timber. Warren Reed, Reedsport, is one of the promotors.

The Vancouver Shipbuilding Company, Vancouver, Wash., has been incorporated by James Feeney and G. B. Percival, and has secured a site for its plant. Work will begin immediately. The first contract will be for a sailing vessel.

According to a recent report the Doernbecher Mfg. Company, Portland, Ore., manufacturer of bedroom and dining room furniture, plans the erection of a new chair factory adjoining its plant at Twenty-eighth Street and the Union Pacific tracks. The proposed structure will be three stories, 100 x 300 ft., costing $50,000. Jacobberger & Smith, Board of Trade Building, Portland, it is understood, will prepare the plans.

The Heath Shipbuilding Company, Portland, Ore., which is starting to fill the location for a new shipyard in South Portland, has opened offices at 410 Oregon Building. Plans are now ready for the first of the frame buildings to be erected. This work will be handled mostly by day labor.

The Port of Bandon, Ore., is having plans prepared for a suction dredge for the Coquille River harbor work to cost $30,000.

The Spokane Sash & Door Company, Spokane, has completed plans for improvements to its plant which will cost $100,000, and will double the output. Enoch Engdahl is president.

Canada

TORONTO, Oct. 7, 1916.

For several months the demand for steel and iron in Canada has reached a point hitherto unsurpassed. Part of this is on account of munitions orders, but aside from this the demand for ordinary consumption has shown unusual activity. This means the re-opening of those industrial enterprises which suffered a severe setback at the beginning of the war.

Agricultural implement manufacturers find the demand from all parts of Canada much better than they anticipated, and on a scale greater than they were prepared to handle. Although the crop in the Canadian West was very light, buying has been good and on a large scale. This would indicate that agriculturalists are not dispirited because of a crop about half the volume of last year's.

The Dodge Metal Hose Company of Canada, Ltd., Galt, Ont., recently incorporated with a capital stock of $150,000, has purchased a site on Beverly Street, Galt, and will erect a factory for the manufacture of malleable iron hose to couple air line between cars, etc. The new plant will cost $50,000. William Lennox is president and Harvey O. Bee vice-president. The directors are John McNaughton, John Mason and E. J. Adams, all of Toronto.

The Canadian Buffalo Forge Company, Kitchener, Ont., will double the capacity of its plant. An addition 50 x 100 ft., will be erected at a cost of $100,000. The company is engaged in the manufacture of munition machinery.

The Ford Motor Company of Canada, Ltd., Ford City, Ont., has commenced the erection of an assembling plant at Calgary, Alberta.

The contract for the erection of a plant for the Dominion Steel Castings, Depew Street, Hamilton, Ont., has been awarded to Mackay & Paulin, Bank of Hamilton, at a cost of $75,000.

Fire Oct. 4 destroyed the foundry and machine shop at Renfrew, Ont., owned by Limbleau & Sons, with a loss of several thousand dollars.

Strong & Dowler, 406 Grain Exchange Building, Calgary, Alberta, are erecting grain elevators at the following towns in Alberta: Braitree, Redlands, Aberlin, Bon Accord, Metiskow, Tofield, Scotford, Rocky Mountain House and Ardenade.

Brown's Copper & Brass Rolling Mills, Ltd., New Toronto, Ont., is building an addition to its plant, of brick and steel, to cost $25,000.

The United Shoe Machinery Company, Bennett Street, Maisonneuve, Que., has begun to erect a plant. H. C. Stone, 84 St. Francois Xavier Street, Montreal, is the architect.

Alrick Archambault's planing and sawmill at St. Martine, Que., was destroyed by fire with a loss of $9,000.

The Canadian Kodak Company, Mt. Dennis, Ont., will erect a concrete and brick factory to cost $12,000.

A. G. Nosworthy, 111 Mountain Hill, Quebec, is preparing plans for a garage and service station to be built in Fabrique Street, Quebec, at a cost of $18,000. It will be of steel, concrete and mill construction.

Work will start at an early date on the erection of a cold storage plant for the Ontario & Manitoba Cold Storage Company, Notre Dame Avenue, Winnipeg, Man. The plant will cost $100,000.

Fire destroyed the cold storage plants at Lindsay, Ont., owned by Flavelles, Ltd. Damage to the ammonia plant and engine room was heavy. The loss will amount to upward of $300,000.

Aimwell D. McIntyre, Toronto, has closed an agreement with the City Council, Port Arthur, Ont., whereby a company in which he is a promoter will establish a plant there for the manufacture of pulp, etc. It will have a capacity of 50 tons per day, which will be extended at a later date to 150 tons.

The first unit of T. McAvity & Son's new plant at St. John, N. B., is now completed, and operations are under way looking to the output of a small order of 8-in. shells. As soon as this order is finished, additional equipment now being installed, will, with that already in service, start on the large contract for the machining of 9.2 in. shells.

The Dominion Steel Foundries, Ltd., Hamilton, Ont., proposes to make further extensions to its plant.

The Willys-Overland, Ltd., is making extensive improve-

ments to its plant at West Toronto, Ont., and proposes to make further additions. T. A. Russell, 276 King Street West, Toronto, is in charge.

The Danville Chair & Specialty Company's factory at Danville, Que., was destroyed by fire with a loss of $8,000.

The Western Power Company of Canada, Ltd., Montreal, has been incorporated with a capital stock of $10,000,000 by Charles M. Holt, Alexandre Chase-Casgrain, Errol M. McDougall, and others, all of Montreal, to build plants to generate electric power, heat, etc.

The Tip-it Welding Company, Ltd., Montreal, has been incorporated with a capital stock of $20,000 by Henry Weinfield, Marcus M. Sperber, Jacob Y. Fortier, and others, to manufacture steel and metal products, etc.

The C. F. Cole Company, Ltd., Toronto, has been incorporated with a capital stock of $50,000 by James S. Lovell, 25 King Street West; Charles D. Magee, 300 St. George Street; William Bain, 185 College Street, and others, to manufacture engineering and scientific instruments, etc.

Work will be commenced at once on the erection of a concrete and brick addition to the plant of the Goldie & McCulloch Company, Ltd., machinery manufacturer, at Galt, Ont. It will be 60 x 144 ft., and will be placed between the boiler shop and the Grand Trunk Railway tracks. The cost will be $15,000. H. P. Second & Sons, Brantford, Ont., have been awarded the contract. A new power plant to cost $20,000 is also being erected on West Main Street.

The Canadian Northern has completed a carbuilding plant in Vancouver, B. C.

The Eastern Car Company, New Glasgow, N. S., will buy a 10 to 15-ton electric traveling crane of 75-ft. span.

Government Purchases

WASHINGTON, D. C., Oct. 9, 1916.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until date not set, schedule 225, for one 135-ton overhead traveling crane, one turret lathe, four milling machines, two wire screw feed machines, two 18-in. x 6-in. x 9½-in. surface grinding machines and one 3-spindle drill press, all for Washington; schedule 242, two wood-working machines for Brooklyn and Mare Island; schedule 243, for one steam hoisting engine and one steam ram pile hammer, both for New Orleans; schedule 244, for five hydraulic lifting jib cranes and one hydraulic bending beam press, all for Norfolk; schedule 245, for one 9-in. x 4-in. outside molder for Boston; schedule 246, for two electrically driven deck winches for Brooklyn; schedule 247, for miscellaneous cutting-off machines, lathes, grinding machines, etc., for Norfolk; schedule 248, for one 16-in. automatic tapping machine for Boston; schedule 249, for one yoke type jaw riveter for Puget Sound; schedule 250, for eight engine room, fire and bilge pumps for Brooklyn and Mare Island; schedule 254, for one metal sawing machine, one 26-in. diameter circular metal saw, one motor-driven high-speed saw and ten 14-in. diameter metal slitting saws, all for Newport; schedule 255, for one pipe and nipple threading machine for Norfolk; schedule 256, for one electric spot welder for Philadelphia.

The following bid was received from the Bethlehem Steel Company under proposal No. 66, by the commanding officer, Frankford Arsenal, Philadelphia, Sept. 22, for furnishing the following:

Item 1, a 500-ton press, installed, with pump, to load shell up to 6-in. for the sum of $36,000. Item 3, 500-ton press with specifications of item 1, to load shell up to and including 4.7-in., for $32,700. Quotation does not include ballast or electric equipment for pump. Price for electric equipment, $1510, f.o.b. arsenal.

The following bids were received by the commanding officer Frankford Arsenal, Philadelphia, Sept. 26, under proposal 107, for furnishing the following: Item 1, four automatic screw machines; item 2, two automatic cutting-off machines; item 3, four automatic screw machines; item 4, six slotting attachments; item 5, two attachments.

Brown & Sharpe Mfg. Company—Item 1, $1,498.50 each, feed tubes $22.50 extra; item 2, $721 each; item 3, $2451 each; item 4, $122 each; item 5, $87.50 each.

Cleveland Automatic Machine Company—Item 1, $1175 each; item 2, $570 each ;Item 3, $1560 each.

The chief of the Bureau of Yards and Docks, Navy Department, Washington, received bids Sept. 30 for the construction of a structural shop at the Norfolk Navy Yard.

No bids were received for furnishing one duplex air compressor under class 1, Panama Canal circular 1081, opened Oct. 3.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, Oct. 3, for supplies for the naval service, as follows:

Schedule 115, Steam Engineering

Class 91, Philadelphia—Two tool grinders—Bid 105, $441.75; 191, $573 and $712.

Schedule 116, Steam Engineering

Class 92, converting planer from belt to motor drive at Boston Navy Yard—Bid 52, $1,780; 176, $1,565.

Schedule 130, Steam Engineering

Class 113, Brooklyn—One motor-driven extension gap lathe—Bid 132, $4,313.

Class 114, Brooklyn—One motor-driven toolroom lathe—Bid 78, $1,153; 115, $2,205.60; 167, $2,173.

Class 115, Brooklyn—One motor-driven toolroom lathe—Bid 78, $1,187.90; 115, $2,031.60; 167, $1,979.

Class 116, Brooklyn—One motor-driven column toolroom shaping machine—Bid 44, $1,338; 115, $1,891.80; 132, $1,800; 167, $1,611.

Class 117, Brooklyn—One motor-driven plain radial drilling machine—Bid 44, $3,251; 132, $1,615; 167, $1,667.

Class 118, Brooklyn—One high-speed sensitive drilling machine—Bid 33, $156.50; 78, $364.35 and $497.35; 85, $392.

Class 119, Brooklyn—One universal milling machine—Bid 69, $2,392.20

Class 120, Brooklyn—One 2-wheel emery grinding machine—Bid 21, $234; 33, $260.

Class 121, Brooklyn—One surface grinding machine and one motor-driven drilling machine—Bid 21, $146; 33, $163.85; 166, $214.

Schedule 138, Construction and Repair

Class 192, Brooklyn and Mare Island—Eight turret turning motors with 2 sets of spare parts—Bid 22, $11,313.60; 57, $10,450; 176, $11,315.16.

Schedule 139, Construction and Repair

Class 193, Brooklyn and Mare Island—Two saw tables—Bid 8, $732.40; 30, $844; 37, $967.70; 44, $1,012; 78, units; 125, $787; 191, $772.

Class 194, New York and Mare Island—Two band saws—Bid 8, $659.20; 30, $708; 44, $900; 125, $827; 191, $692.

Class 195, Brooklyn and Mare Island—Two wood-working lathes—Bid 8, $1,128; 125, $1,122.

Class 196, Brooklyn and Mare Island—Two drill presses—Bid 191, $916.

Class 197, Brooklyn and Mare Island—Two emery grinding machines—Bid 21, $320; 30, $332; 33, $202.

The names of the bidders and the numbers under which they are designated in the above list, are as follows:

Bid 8, American Woodworking Machinery Company; 21, Cincinnati Electrical Tool Company; 22, Cutler-Hammer Mfg. Company; 30, W. Irwin Cheyney; 33, James Clark, Jr., Electric Company; 37, Alexander Dodd & Co.; 44, Fairbanks Company; 52, General Electric Company; 57, B. F. Goodrich Company; 69, Hill, Clarke & Co., Inc.; 78, Kemp Machinery Company; 85, Leland-Gifford Company; 105, Manning, Maxwell & Moore, Inc.; 115, Niles-Bement-Pond Company; 125, Oliver Machinery Company; 132, Henry Prentiss & Co.; 166, United States Electrical Tool Company; 167, Vandyck-Churchill Company; 176, Westinghouse Electric & Mfg. Company; 191, D. Nast Machinery Company.

Sealed proposals will be received by the quartermaster department; United States Marine Corps, 1100 South Broad Street, Philadelphia, until 11 a. m., Oct. 16, for furnishing one 20-hp. stationary boiler.

German Machinery Industry Substituting Materials

At a recent meeting of the German Machinery Manufacturers' Association the president stated that the chief task had been to obtain substitutes for the lacking raw materials and to reorganize the works to produce war materials. He considered the situation clear up to the end of the war, but the position of the trade after that could not be foreseen; nevertheless, the industry felt itself strong enough to carry on the struggle successfully even though the conditions might be difficult. A paper was read on the use of substitute materials in which it was stated that certain new lead alloys are being successfully used as a bearing metal together with cast iron subjected to a special heat treatment. Wrought-iron tubes have been used in condensers without affecting the vacuum. Lubricating oil is being diluted with graphite, especially for cylinders, and leather driving belts are being replaced by steel bands on paper-yarn belts—all of which will render the country more independent of foreign supplies in the future.

NEW TRADE PUBLICATIONS

Chain Drives.—Diamond Chain & Mfg. Company, Indianapolis, Ind. Booklet entitled, "Diamond Tooth Form for Roller Chain Sprockets." Covers the subject of power transmission by roller chains and includes information on the design of roller chains and sprockets with formulæ for calculating chain lengths, center distances where the chain has no slack, pitch and outside diameters, horsepower transmitted, chain velocity and pull, sprocket speeds and the maximum allowable pitch and speed. A table of useful data is included and a problem in the selection of the proper chain and sprocket for a set of given conditions is worked out and discussed to illustrate the application of the formulæ.

Bronze Alloy.—Sherritt & Stoer Company, Inc., 603 Finance Building, Philadelphia, Pa. Form No. 507. Deals with a bronze alloy known as Machinebronze for use in automobile and machinery construction and repair. Tables of the various sizes of solid and cored bars that can be supplied in 12-in. lengths are included.

Gage Standards.—Wismach & Ibsen, Milwaukee, Wis. Circular. Treats of a line of rectangular steel gage blocks and standards for use in a holder. An illustration showing the way the units are combined and one of the units mounted in a holder are presented. Tables of the various combinations that can be furnished are included.

Safety Appliances.—Wheeler & Holcomb, 1360 Wells Street, Chicago, Ill. Pamphlet. Lists a line of fireproof gloves, mittens, leggins, aprons, pants, coats and other specialties made from asbestos cloth and fireproof duck and leather. Illustrations and brief descriptions are presented, together with tables of the various sizes that can be furnished.

Eye Protectors.—Chicago Eye Shield Company, 2300 Warren Avenue, Chicago, Ill. Circular. Illustrations and descriptive matter explain the use of the various types of eye protectors made for use in foundries, industrial establishments and railroad and blast-furnace work. A line of respirators and safety helmets is also shown.

Chucks.—Thomas Elevator Company, 20 South Hoyne Avenue, Chicago, Ill. Folder. Mentions a line of wrenchless chucks for machine tools in which the opening and closing of the jaws is accomplished by a set of gears that are always in mesh. Views of the chuck in use, a number of dimension diagrams and a drawing of the operating mechanism are included.

Portable Electric Tools, Electric Motors and Flexible Shafting.—Stow Mfg. Company, Binghamton, N. Y. Three bulletins. The first, No. 100, shows the various adjustable and constant speed motors than can be supplied. The text is supplemented by a number of drawings illustrating the construction and dimension tables and diagrams. The second, No. 101, contains illustrations and brief descriptions of the various electric tools, which include drilling, buffing and grinding, screw driving and sensitive drilling machines. Tables of the different sizes of each tool that can be supplied are included. The last bulletin, No. 102, describes and illustrates a number of applications of the company's flexible shafts to various types of tools.

Fuel Oil Appliances.—W. S. Rockwell Company, 50 Church Street, New York City. Bulletin No. 31. Presents some of the fundamental principles governing the handling and burning of fuel oil. This introductory section is supplemented by views of installations of oil-fired furnaces for various purposes and is followed by illustrated descriptions of the various appliances used, such as burners, pumps and pumping systems, blowers, storage and pressure tanks, regulating valves, strainers, pressure gages, etc. A partial list of the various types of furnaces which the company has built is included.

Galvanometer.—Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa. Bulletin No. 250. Describes a galvanometer for general laboratory use. The description of the instrument is quite comprehensive and is arranged in paragraphs with a bold face heading indicating clearly the subject covered. Views of the galvanometer with and without the case are presented and mention is made of a number of attachments that can be supplied for use with it.

Electric Motors.—Lincoln Electric Company, Cleveland, Ohio. Booklet. Relates to a line of induction motors for use on two or three phase alternating-current circuits. After a brief discussion of the advantages of motor drive, the various parts of the motor are described at some length, the text being supplemented by numerous illustrations. This is followed by descriptions of the different classes of motors for elevators and hoists, pumps, fans, blowers and compressors. A number of illustrations of the motors in use in a great variety of industrial establishments are included. Mention is also made of an arc welding machine which was illustrated in THE IRON AGE, Aug. 5, 1915.

Power Presses.—Cleveland Machine & Mfg. Company, Cleveland, Ohio. Catalog. Size, 6 x 9 in.; pages, 120. Describes and illustrates a complete line of power presses including inclinable, open back, punch, single and double crank straight sided and gap frame, horning, wiring, screw, knuckle joint, cam and toggle drawing and notching types. Mention is made of other sheet metal working machinery, such as seaming machines, power brakes, power hammers and power squaring, gap splitting and squaring shearing machines.

Non-Packing Valves.—Universal Valve Company, 910 South Michigan Avenue, Chicago, Ill. Pamphlet. Refers to a line of non-packing valves for either saturated or superheated high-pressure steam. After a brief description of the construction of the valve, which employs a non-rising handle, the various forms in which it can be supplied are illustrated with tables of sizes.

Silent Chain Drive.—Link-Belt Company, Thirty-ninth Street and Stewart Avenue, Chicago, Ill. Booklet No. 286. Devoted to lubrication and casings for silent chain drives. Drawings of the casing are presented, together with engravings of it and views of the drive in use.

Gears.—Philadelphia Gear Works, 1120 Vine Street, Philadelphia, Pa. Catalog. Illustrates an extensive line of gears of the spur, bevel and spiral types that can be supplied in steel, brass, iron and rawhide. Under the illustrations of the different gears tables of the various sizes that can be supplied are presented. Mention is made of a line of chains and sprockets and the work which the company is prepared to do in the production of special gearing. A number of tables of useful information are included.

Multiblade Fans.—Clarage Fan Company, Kalamazoo, Mich. Catalog No. 5. Concerned with multiblade type of fan. Capacity tables for various arrangements of inlets and different widths are included, and a diagram and table of dimensions of the several sizes built are given. Mention is made of other products, such as steel plate fans, pipe coil heaters, exhaust fans and pressure blowers, etc.

Small Tools and Cutters.—Brown & Sharpe Mfg. Company, Providence, R. I. Catalog No. 27. Relates to an extensive line of small tools, cutters, screw machine tools, and similar equipment.

Acetylene Gas Tips and Burners.—American Lava Company, Chattanooga, Tenn. Catalog No. 19. Gives illustrations and brief descriptions in French, Spanish and English of a line of standard acetylene gas tips and burners and tips and burners for all other gases. An engraving showing the special shapes that can be supplied in quantity lots is presented.

Autogenous Welding and Cutting Equipment.—Searchlight Company, 415 Karpen Building, Chicago, Ill. Catalog No. 12. Gives specific information on the welding and cutting of metals by the oxy-acetylene process, together with a catalog of the equipment required for such work. After a brief description of the process and its advantages in machine and repair shops and manufacturing plants, a number of views of the apparatus at work are shown, and a list of the uses of the apparatus given. Engravings of the apparatus are presented and mention is made of accessories such as torches, welding rods, fluxes, welding tables, hose, goggles, etc. A table giving the approximate gas consumption an dcost of welding with the various tops is included.

Grinding Wheels.—Waltham Grinding Wheel Company, Waltham, Mass. Catalog No. 16. Illustrates and describes a line of straight, cup and cylinder grinding wheels, together with wheels for standard and special machines. Tables of the several sizes of each kind of wheel that can be supplied and others of the speeds that should be employed for various diameters of wheels are included. A number of general suggestions on the selection, mounting and use of the wheels are presented together with general and shape indexes.

Electric Hammer Drilling Machine.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. Bulletin No. E-43, superseding No. E-38. Points out the advantages of using a universal electric hammer drilling machine for cutting holes in stone and concrete and for light chipping. A brief description of the machine is presented and the text is supplemented by a view of the machine in use and the different forms of steel that are employed with it.

Lifting Magnets.—Electric Controller & Mfg. Company, Cleveland, Ohio. Calendar hanger measuring 16¼ x 18½ in. The upper half of the hanger is given over to an illustration of one of the company's lifting magnets in use for handling pig iron. The calendar leaves, which contain the dates for three months occupy practically all of the lower half. Mention is made of the company's lifting magnets and automatic motor starters as a means of reducing labor costs and increasing output.